FREE
Programmer's Chart
INSIDE

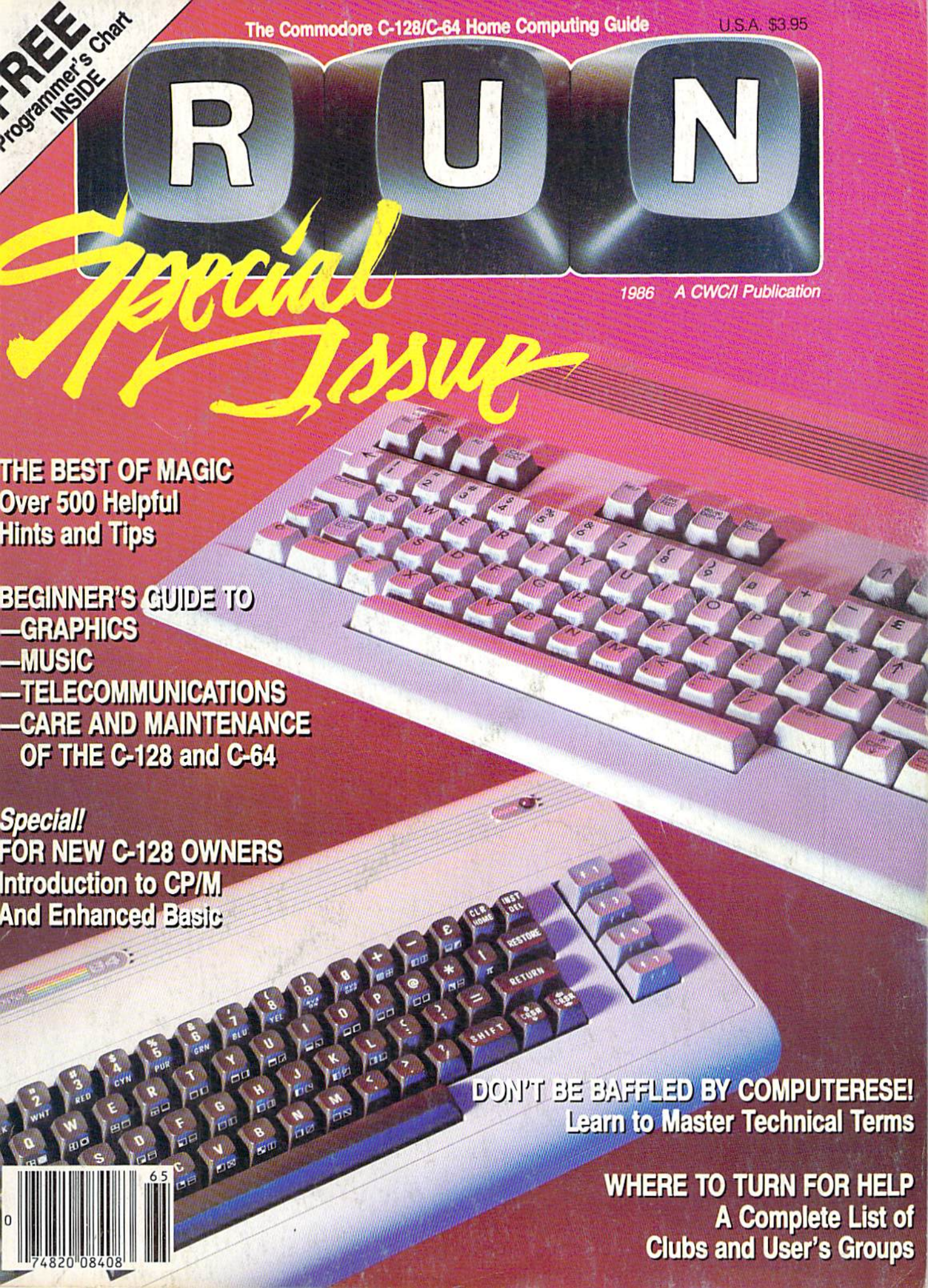
The Commodore C-128/C-64 Home Computing Guide

U.S.A. $3.95

RUN

Special Issue

1986 A CWC/I Publication



THE BEST OF MAGIC
Over 500 Helpful
Hints and Tips

BEGINNER'S GUIDE TO
—GRAPHICS
—MUSIC
—TELECOMMUNICATIONS
—CARE AND MAINTENANCE
OF THE C-128 and C-64

Special!
FOR NEW C-128 OWNERS
Introduction to CP/M
And Enhanced Basic

DON'T BE BAFFLED BY COMPUTERESE!
Learn to Master Technical Terms

WHERE TO TURN FOR HELP
A Complete List of
Clubs and User's Groups

0 74820 08408 65

Circle 410 on Reader Service card.

Fleet System 2.™
Word processing that *spells* V-A-L-U-E.

Complete word processing with built-in 90,000 word spell checking - Only $79.95

Up till now, you'd have to spend a minimum of about $70 to get a good word processor for your Commodore 64™/128™. And if you added a small, *separate* spell checking program, you'd be out well over $100!

Now there's Fleet System 2! It's two powerful programs in one, and it's perfect for book reports, term papers or full office use.

Fleet System 2 combines the EASIEST and most POWERFUL word processor available with a lightning-fast 90,000 word spelling dictionary — all in one refreshingly EASY TO USE integrated system. Finally, spell checking is now available at your fingertips.

You can even add over 10,000 "custom" words to the built-in 90,000 word dictionary. And at a suggested retail price of $79.95, Fleet System 2 really spells V-A-L-U-E, and 90,000 other words too!

Fleet System 2 helps people of all ages to learn to *spell correctly* and *write better* too. It's the ONLY full featured word processor that provides you with helpful writing and VOCABULARY FEEDBACK such as: the total number of words in your document, the number of times each word appears, and total number of "unique" words, just to name a few.

Fleet System 2 has every important feature that will help you make child's play out of the most heavy duty typing tasks. There's Built-in 80 Column Display — so what you see is what you get, Horizontal Scrolling During Typing, Easy Correction and Movement of Text, Page Numbering, Centering, Indenting, Headers and Footers, Math Functions, Search and Replace, Mail Merge, BUILT IN 90,000 word SPELL CHECKING and much, much more!

Ask for Fleet System 2. Exceptionally Easy. Packed with Power. Perfectly Priced.

UNITED STATES COMMODORE USERS GROUP APPROVED

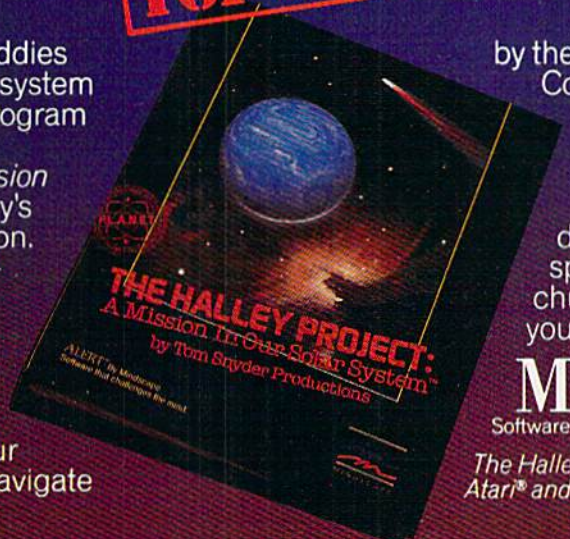
PSI Call 1-800-343-4074 for the Dealer nearest you!
Professional Software, Inc., 51 Fremont Street, Needham, MA 02194 (617) 444-5224

Fleet System 2™ is a trademark of Professional Software, Inc. — Fleet System 2™ was designed and written by Visiontronics, Ltd. — Commodore 64™ and Commodore 128™ are trademarks of Commodore Electronics Ltd. — Some printers may not support certain Fleet System 2 functions and/or require an interface. Please check with your dealer. — Dealer and Distributor inquiries are invited.

Circle 402 on Reader Service card.

Just tell your friends you're going on a very long trip.

TOP SECRET



Kiss your earthbound buddies goodbye and travel the solar system in the most exciting space program ever envisioned.

The Halley Project: A Mission In Our Solar System™ is history's first real-time space simulation. Its challenge provides out-of-this-world stimulation.

Lightweight space jockeys need not apply, this one's for qualified star pilots. A rigorous ten-mission training program will test your knowledge and skill as you navigate by the stars from planet to planet.

Complete all ten missions and be invited to face the ultimate challenge: the incredible secret eleventh mission.

So take off to a software dealer and join an elite group of space explorers. As for your chums, tell them you'll wave as you fly over.

Mindscape

Software that challenges the mind.

The Halley Project is available on: Apple,® Atari® and Commodore®

Mindscape, Inc. 3444 Dundee Road, Northbrook, Illinois 60062, 1-800-221-9884 (In Illinois 1-800-942-7315)

Copyright © 1985, Mindscape, Inc. All Rights Reserved. Apple, Atari, and Commodore are registered trademarks of Apple Computer, Atari Inc., and Commodore Business Machines.

Circle 425 on Reader Service card.

New toll free number:
1-800-541-1541

KEYMASTER

The easiest-to-use, most-powerful disk backup program ever written for the 64.

With one 1541 drive:

- **FAST** FILE COPIER — up to 5 times faster!
- **FAST** full protected — disk GCR nibble copier
- **FAST** full unprotected — disk copier
- **KEYMASTER** protected — disk unlocking kit**
- **FAST** 10 second disk formatter

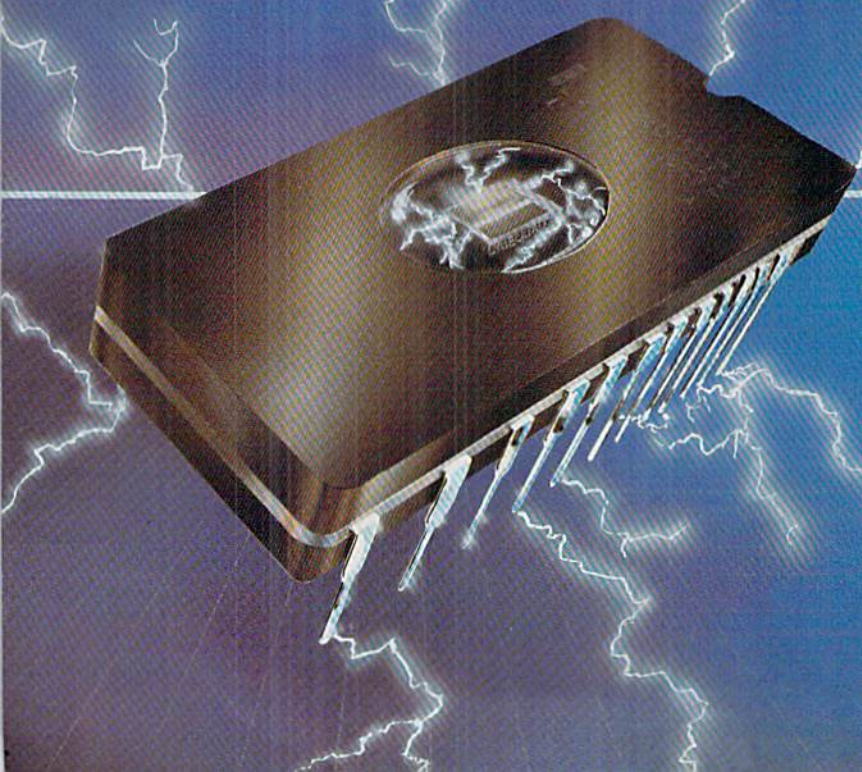
With two 1541 drives (NO disk swapping required during copying):

- **FAST** file copier — up to 6 times faster!
- **FAST** full protected — disk GCR nibble copier
- **FAST** full unprotected — disk copier

** **KEYMASTER** unlocks protected disks by **ELIMINATING** the protection scheme originally written on the disk.
** Once one of KEYMASTER's KEYS has unlocked a disk, the program can generally be **FILE COPIED** onto another disk (also making the program compatible with non-1541 drives). If it is not file copyable, it can be fast nibble copied.
** **50 KEYS** for popular programs will be provided on the first KEYMASTER disk.
** Frequent updates of 25 to 50 additional KEYS will be available (no original disk return required for updates!).

ALL OF THIS AT THE RIGHT PRICE! ONLY —
$29.95 for KEYMASTER
$10.00 for update disks
KEYMASTER created by Jim Drew.

New toll free number:
1-800-541-1541



MAGNUM LOAD BLOWS THE OTHERS AWAY!

ATTENTION 1541 AND MSD OWNERS!

- MAGNUM LOAD will LOAD and VERIFY programs up to **6 TIMES FASTER** than before. It is a new replacement KERNAL (operating system) ROM chip for your Commodore 64 or 128 computer.
- A high-speed loader, high-speed verify, disk drive no-head-rattle routine (1541 drive) and a BASIC UNNEW ROUTINE (MSD drive) have replaced the Datasette tape routines.
- The first program on a disk may be loaded and run by pressing only two keys (SHIFT/RUN).
- Unlike the older, cartridge-style fast loaders, no ports are tied up at the rear of your computer, the screen is not blanked during loading and there is no wear-and-tear on the game port.
- For maximum convenience and performance, MAGNUM LOAD is installed DIRECTLY in the circuit board. Generally, a socket has already been provided to make the operation easy, but occasionally some soldering may be required.
- Now you can give your 1541 disk drive "1571 speed."

The chart below compares ACTUAL MEASURED loading times.

PROGRAM	STAR DOS	REGULAR LOAD	MACH 5	FAST LOAD	MAGNUM LOAD
Pitstop II (EPYX)	?	144 sec	43 sec	41 sec	31 sec
Music Shop (BRODERBUND)	?	105 sec	105 sec*	105 sec*	21 sec
Hitchhiker's Guide to the Galaxy (INFOCOM)	?	70 sec	70 sec*	**	68 sec*
On-field Football (GAMESTAR)	?	159 sec	66 sec	63 sec	56 sec
EASY FINANCE I (COMMODORE)	?	58 sec	13 sec	13 sec	11 sec

* = Will not fast load — defaulted back to regular load.
** = *Failed to load at all.*

FIVE VERSIONS OF MAGNUM LOAD ARE AVAILABLE TO FIT ANY NEED

VERSION	APPLICATION	PRICE
A	C64 computer and one 1541 drive	$24.95
B	C64 and one MSD drive (single or dual)	$24.95
C	C64, one 1541 drive AND one MSD drive (switchable)	$29.95
D	C128 computer and one 1541 drive***	$24.95
E	C128 and one MSD drive (single or dual)***	$24.95

*** = Fully compatible with 128 & CP/M modes. Cartridge versions MUST be UNPLUGGED to access 128 & CP/M modes!

ORDER THE VERSION YOU NEED NOW!

MAGNUM LOAD created by Jim Drew

C64, C128, 1541, 1571 and Datasette TM Commodore; MSD TM Micro Systems Development; MACH 5 TM ACCESS; FAST LOAD TM EPYX; STAR DOS TM Star Point

Circle 425 on Reader Service card

THE SHADOW $89.95

Shadow is a new and revolutionary piece of hardware that is used to duplicate even the most protected software. Fitting inside the disk drive (no soldering required), SHADOW takes complete control of all functions giving near 100% copies.

Being the best utility available today, it will even copy the other copy programs.

Because of the Shadow's unique abilities, we feel DOS protection is a thing of the past.

*HACKER PACKAGE $39.95

Shadow a disk while it loads, then read an exact list of:

- Track, sector, ID, check sum, drive status
- High and low track limits
- Density use on each track
- Half tracks that are used
- Command recorder shows commands that were sent to 1541 while program was loading
- RAM recorder records custom DOS

Shadow-scan any disk, then read exact list of:

- Valid tracks, half tracks, partial tracks and segments
- Sync mark link, header block links and data block links
- Track to track synchronization

Exclusive snap shot recorder will give you an exact copy of the 1541 RAM and can be viewed, saved or printed. Plus many more features included.

*Requires Shadow

*GT PACKAGE $44.95

Highly sophisticated and integrated piece of hardware that turns you 1541 into something you've always wanted.

- Track and sector display
- Drive reset switch
- Device number change
- Half track indicator
- Abnormal bit density indicator
- Shadow on-off indicator

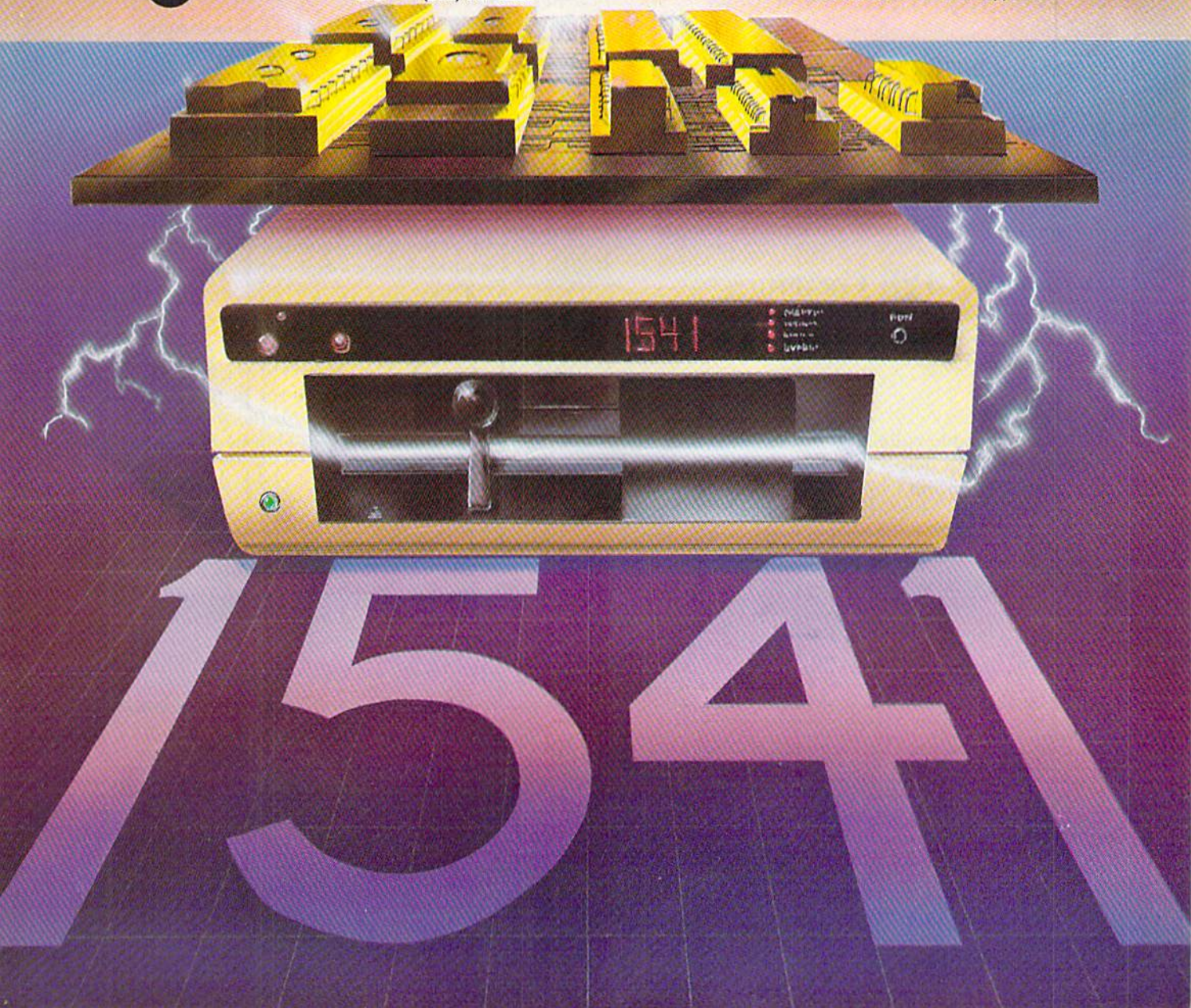
The Shadow display will give you an accurate display of precisely what track you are accessing during a normal load even if the program does a read past track 35.

*Requires Shadow

Order by phone 24 hrs./7 days or send cashier's check/money order payable to Megasoft. Visa, MasterCard include card number and expiration date. Add $3.50 shipping/handling for continental U.S., $5.50 for UPS air. CODs add $7.50, Canada add $10.00. Other foreign orders add $15.00 and remit certified U.S. funds only. Distributors invited and supported.

MegaSoft LTD

P.O. Box 1080 • Battle Ground, Washington 98604
1-800-541-1541
Canadian/Foreign Orders Call
(206) 687-5205



SPECIAL ISSUE, 1986

FEATURES

6 RUNning Ruminations

6 Publisher's Notes

8 Programming Primer
If you can follow instructions, then you can program. Here's an easy-to-understand guide to help you.
By David A. Hook

20 C-64/C-128 Graphics
An introduction to the world of C-64 and C-128 graphics programming.
By Louis Wallace

34 Magic
An invaluable collection of 512 hints and tips that will help you get the most out of your computing experience. A complete index of the Magic tricks, arranged according to 34 categories, begins on p. 158.
By Louis F. Sander

Cover photography by Ed Judice

48 The Sound of C-128 Music
With the C-128's Basic 7.0 commands, generating music is as easy as do-re-mi.
By Matthew Stern

54 Get On-Line! Discover the World of Telecommunications
An introduction to this exciting world, along with reviews of Commodore's modems and a list of the major commercial networks available.
By Peggy Herrington

62 C-128 Programmer's Aid
Here's an opportunity for programmers to become acquainted with the powerful new commands made available by the C-128's enhanced Basic.
By Morton A. Kevelson

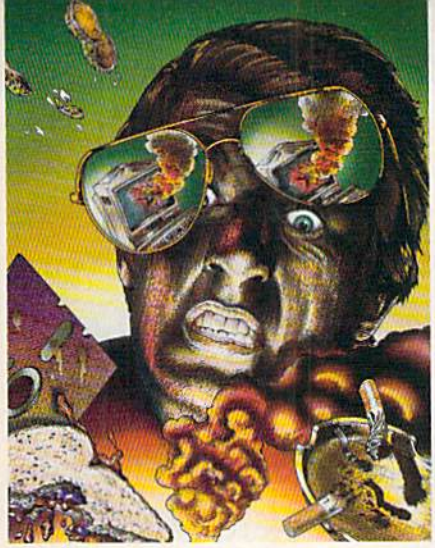
70 CP/M and the C-128
Unlock your C-128's capability to run CP/M programs, which are numerous and virtually free.
By Cheryl Peterson

RUN (ISSN 0741-4285) is an independent journal not connected with Commodore Business Machines, Inc. *RUN* is published monthly by CW Communications/Peterborough, Inc., 80 Pine St., Peterborough, NH 03458. U.S. subscription rates $19.97, one year; $29.97, two years; $41.97, three years. Canada and Mexico $22.97, one year, U.S. funds drawn on U.S. bank. Foreign $39.97, one year, U.S. funds drawn on U.S. bank. Foreign air mail subscriptions—please inquire. Second class postage paid at Peterborough, NH, and at additional mailing offices. (Canadian second class mail registration number 9565.) Phone: 603-924-9471.

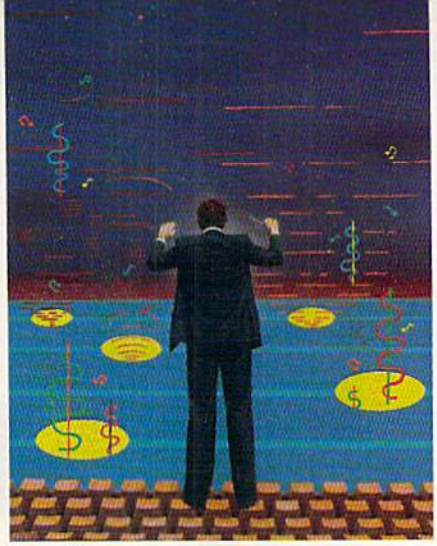
Entire contents copyright 1985 by CW Communications/Peterborough, Inc. No part of this publication may be printed or otherwise reproduced without written permission from the publisher.

Postmaster: send address changes to *RUN*, Subscription Services, PO Box 954, Farmingdale, NY 11737. (Send Canadian changes of address to *RUN*, PO Box 1051, Fort Erie, Ontario, Canada L2A 5N8.) Nationally distributed by International Circulation Distributors. *RUN* makes every effort to assure the accuracy of articles, listings and circuits published in the magazine. *RUN* assumes no responsibility for damages due to errors or omissions.

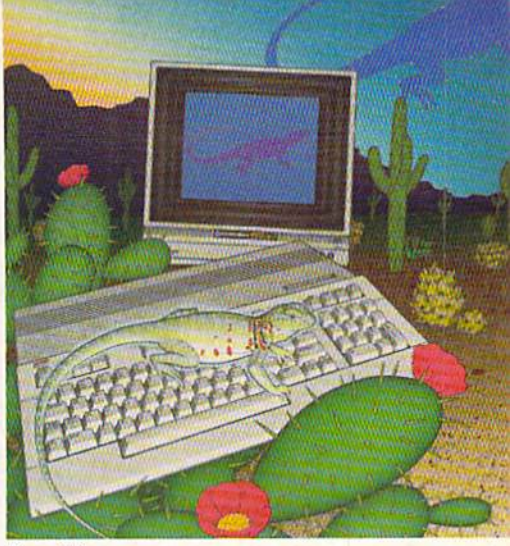
Manuscripts: Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. *RUN* assumes no responsibility for loss or damage to any material. Please enclose a self-addressed, stamped envelope with each submission. Unsolicited manuscripts that cannot be accepted will be returned only if accompanied by an appropriately sized, adequately stamped, self-addressed envelope. Payment for the use of any unsolicited material will be made upon acceptance. All contributions and editorial correspondence (typed and double-spaced, please) should be directed to *RUN* Editorial Offices, 80 Pine Street, Peterborough, NH 03458; telephone: 603-924-9471. **Advertising Inquiries** should be directed to Advertising Offices, CW Communications/Peterborough, Inc., Elm Street, Peterborough, NH 03458; telephone: 800-441-4403. **Subscription problems or address changes:** Call 1-800-645-9559 or write to *RUN*, Subscription Department, PO Box 954, Farmingdale, NY 11737. **Problems with advertisers:** Send a description of the problem and your current address to: *RUN*, Elm Street, Peterborough, NH 03458, ATTN.: Rita B. Rivard, Customer Service Manager, or call 1-800-441-4403.



Page 74.



Page 48.



Page 34.

74 How to Avoid Computer Disaster

Hardware and software tips that will help you prolong the life of your Commodore computer system.
By Annette Hinshaw

80 Definitions & Demonstrations

A comprehensive list of C-64 and C-128 commands, statements, functions and reserved variables, along with examples of how you may use them for programming.
By Margaret Morabito

162 Commodore Clubs

Commodore computing around the world. A list of over 700 user's groups across the United States and in 19 other countries.

Plus: Programmer's Reference Chart

RUN is a member of the CW Communications/Inc. group, the world's largest publisher of computer-related information. The group publishes 57 computer publications in more than 20 major countries. Nine million people read one or more of the group's publications each month. Members of the group include: Argentina's *Computerworld/Argentina*; Asia's *The Asian Computerworld*; Australia's *Computerworld Australia, Australian PC World, Macworld* and *Directories*; Brazil's *DataNews* and *MicroMundo*; China's *China Computerworld*; Denmark's *Computerworld/Danmark, PC World* and *RUN* (Commodore); Finland's *Mikro*; France's *Le Monde Informatique, Golden* (Apple), *OPC* (IBM) and *Distributique*; Germany's *Computerwoche, Microcomputerwelt, PC Welt, SoftwareMarkt, CW Edition/Seminar, Computer Business, RUN* and *Apple's*; Italy's *Computerworld Italia* and *PC Magazine*; Japan's *Computerworld Japan*; Mexico's *Computerworld/Mexico* and *CompuMundo*; The Netherland's *ComputerWorld Benelux* and *PC World Benelux*; Norway's *Computerworld Norge, PC World* and *RUN* (Commodore); Saudi Arabia's *Saudi Computerworld*; Spain's *Computerworld/Espana, Microsistemas/PC World* and *Commodore World*; Sweden's *ComputerSweden, Mikrodatorn*, and *Svenska PC*; the UK's *Computer Management, Computer News, PC Business World* and *Computer Business Europe*; the U.S.' *AmigaWorld, Computerworld, Focus Publications, HOT CoCo, inCider, InfoWorld, MacWorld, Micro Marketworld, On Communications, PC World, RUN, 73 Magazine, 80 Micro*; Venezuela's *Computerworld Venezuela*.

Publisher—Stephen Twombly

Editor-In-Chief—Dennis Brisson
Managing Editor/Production—Swain Pratt
Copy Editor—Marilyn Annucci
Review Editor—Susan Tanona
New Products Editor—Harold Bjornsen

Technical Manager—Margaret Morabito
Technical Editor—Timothy Walsh

Associate Editors—Christine Adamec, Robert Baker, Louis F. Sander, Jim Strasma, Guy Wright

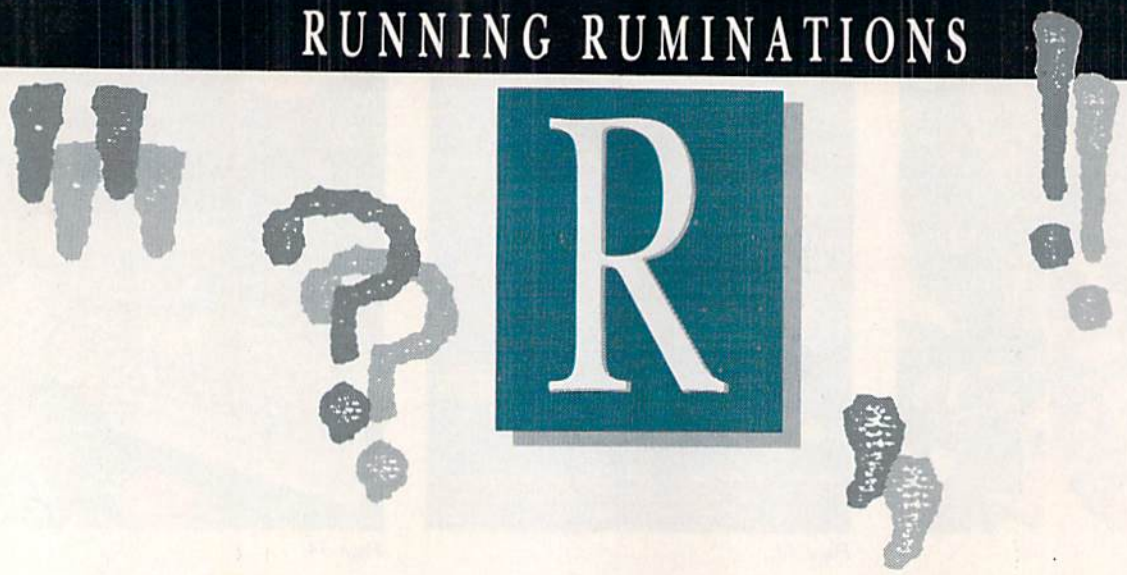
Advertising Sales Manager—Stephen Robbins
Sales Representatives—Ken Blakeman, Nancy Potter
Ad Coordinator—Heather Paquette
1-800-441-4403
Marketing Coordinator—Wendie Haines
West Coast Sales—Giorgio Saluti, manager
1-415-328-3470
1060 Marsh Road
Menlo Park, CA 94025

Art Director—Glenn Suokko
Production/Advertising Supervisor—Rosalyn Scribner
Editorial Design—Anne Dillon, Karla M. Whitney

Graphic Services Manager—Dennis Christensen
Film Preparation Supervisor—Robert M. Villeneuve
Typesetting Supervisor—Linda P. Canale
Typesetter—Doreen Means

Manufacturing Manager—Susan Gross

President/CEO—James S. Povec
Vice-President/Finance—Roger Murphy
Vice-President of Planning and Circulation—William P. Howard
Business Manager—Matt Smith
Executive Creative Director—Christine Destrempes
Circulation Manager—Frank S. Smith
Direct & Newsstand Sales Manager—Raino Wirein
800-343-0728
Director of Credit Sales & Collections—William M. Boyer
Founder—Wayne Green



Special Issue Highlights

In any professional sport, it is difficult to duplicate back-to-back championship seasons. In recent years, neither the Dodgers, Redskins nor Celtics could do it.

But we think that we have assembled a repeat winner in this 1986 version of the *RUN* Special Issue.

For the second year in a row, we are presenting an all-star collection of authors and programmers to address the needs of today's Commodore home-computer user.

This Special Issue contains valuable information—introductory articles and handy reference material—that our readers will want to refer to again and again throughout the coming year.

For example, you'll witness the "magical" talents of Lou Sander, who serves up 72 pages of computing hints and tips—all of the "tricks" published in the 1985 issues of *RUN*, plus over 200 never-before-published tricks developed especially for this issue. For your easy reference, these tricks are indexed and organized by topic—disk tips, programming techniques, printer hints, etc.

You'll also recognize some other regular contributors to *RUN*—such as Margaret Morabito, Cheryl Peterson and Louis Wallace—who have prepared articles to familiarize readers with the features of both the C-64 and C-128. Every facet of Commodore computing—programming, music and sound, graphics, telecommunications, computer maintenance—is explored in this issue.

Every programmer worth his function keys will want to make room on his wall for this year's wall chart filled with easy-reference material—whether he programs in Commodore Basic 2.0, Basic 7.0, or any version in between. All the reference material programmers are constantly seeking out in manuals—keywords, commands, programming codes—is featured in one visually attractive chart.

This Special Issue comes at a particularly appropriate time for C-128 owners desperate for information about their new computer. We've featured articles that guide new owners through the uncharted territory of CP/M and enhanced Basic, as well as telecommunications, music and sound and graphics.

Whether you're a new C-128 owner, a long-time or intermediate C-64 user or a novice—this issue promises to be a big hit among Commodore computing fans.

db

Something Special

Welcome to the second annual edition of *RUN*'s Special Issue!

The introduction and shipment of Commodore's new C-128 was certainly the most significant event in the Commodore computing world in 1985. With this computer, Commodore targets a whole new audience of computer users, while still addressing the concerns of loyal C-64 users by making the machine 100% C-64 compatible.

Besides the extra 64K of memory, the new C-128 features CP/M mode, enhanced Basic 7.0, additional function keys, a numeric keypad and other features that make this machine a user's delight. Owners of the C-128 also share (in C-64 mode) the C-64's outstanding software base and potential for enhanced applications.

In this issue, the editorial staff has assembled articles that speak to the interests of both C-64 and C-128 users. Included is a variety of useful and pertinent reference material for every aspect of Commodore computing.

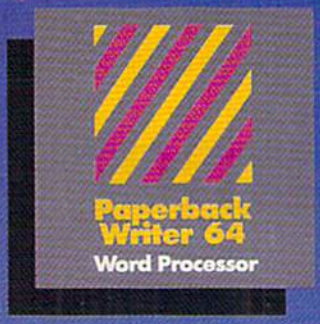
In addition, there are over 500 helpful computing hints and tips from the popular Magic column, a helpful glossary that defines—in easy-to-understand terms—computer expressions and terminology, a comprehensive list of Commodore clubs and a convenient pull-out wall chart that provides programmers with handy reference material.

This Special Issue will serve as a convenient reference source throughout the year. We are confident that it fully meets the standards you have come to expect from *RUN* magazine.

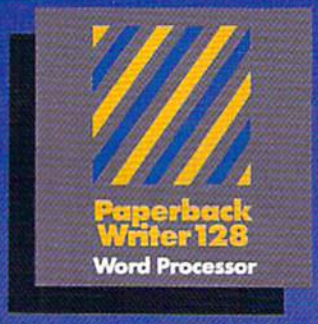
ST

Circle 405 on Reader Service card.

Solutions!



PW 128/64 Dictionary
also available at $14.95 (U.S.)



MAIL ORDERS:

CRYSTAL COMPUTER INC.
In Michigan 1-517-224-7667
Outside Michigan 1-800-245-7316
24 hours a day, 7 days a week

U.S. DEALER ENQUIRIES:

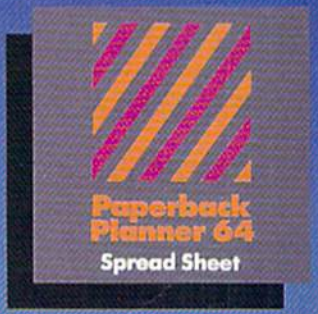
ALLEGRO TECH
1-800-544-1004
In Massachusetts
1-413-443-9443

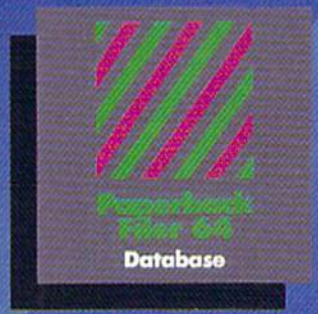
MICRO-PACE COMPUTERS INC.
1-800-362-9653
In Illinois
1-217-356-1884

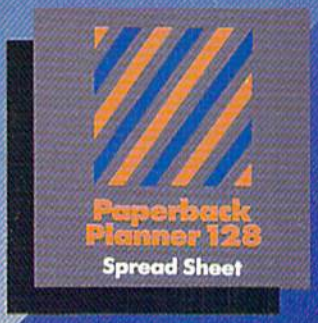
MICRO-SYS DISTRIBUTORS
1-800-527-1738
In Texas
1-214-231-2645

CANADIAN DEALER ENQUIRIES:

FRANKLIN WINTER
Consulting & Sales
1-416-822-5974







Best-selling software for Your Commodore 128 or 64

You want the very best software you can find for your Commodore 128 or 64, right?

You want integrated software — word processing, database and spreadsheet applications — at a sensible price. But, you also want top-of-the-line features. Well, our Paperback 128/64 software goes one better.

With Paperback 128 or 64, you'll find all the features you can imagine . . . and then some. And Paperback 128/64 is so easy to use, you won't even need the reference guide. On-screen and in memory instructions will have you up and running in less than 30 minutes, even if you've never used a computer before.

The price? It's as low as you'd expect for a line of software called 'Paperback'. Suggested Retail Price for the 64 Software is $39.95 (U.S.) and $49.95 (U.S.) for the 128. Any of the 64 products may be upgraded to their 128 version for $15.00 (U.S.) + $3.00 shipping and handling. (Available to registered owners from Digital Solutions Inc. only.)

Paperback Writer 128 or 64, Paperback Planner 128 or 64 and Paperback Filer 128 or 64 . . . **Solutions** at sensible prices from Digital Solutions Inc.

International & Distributor enquiries to:

Serious software that's simple to use.

Digital Solutions Inc.

P.O. Box 345, Station A
Willowdale, Ontario
Canada M2N 5S9
1-416-221-3225

Paperback Writer 128 and 64 are now available in French.

Programming Primer

Take charge of your computer and begin writing your own programs. You need only learn some fundamentals.

By DAVID A. HOOK

In the good old days of microcomputers (1978, in my case), non-business software was nowhere to be found. If you didn't learn to write it yourself, you were out of luck. Nowadays, there is plenty of software available, but there is also a revival of people interested in programming.

This article is dedicated to the beginning programmer. For guidance and practice, consult the manual that came with your computer. And please type in the example programs, as you cannot hope to learn without *doing*!

Programming, or Playwrighting

Regardless of the computer language used, a program is just a series of instructions to be performed. Once you turn on your Commodore computer, the Basic language is available to you. If you follow its rules of grammar, then you can instruct the computer to complete a task for you.

The computer can perform only two fundamental processes: arithmetic and logic. It can calculate very quickly and can compare whether one value is "bigger" than another. Depending on the results of the calculation and comparison, it can appear to "automatically" handle a wide variety of cases.

This illusion of "thinking" is, of course, performed by the program. The challenge of programming is to reduce such a process to the limited vocabulary of a computer language. The C-64 and C-128 share about 60 key words that form the Basic language, and their syntax is quite rigid—one error can cause a program to fail.

A computer program can be thought of as a play. Its instructions represent the script, and you are acting as the playwright.

Like a play, a program must have an introduction, provide some development and reach a conclusion. In the data-processing world, however, you would use the terms input, processing and output. The Basic language has many instructions that will fit into one of these three parts. If your program has been well-organized, these distinctions are clear. Within this framework, we define two categories: commands and instructions.

Basic commands are words that apply to the whole play. Instructions, or program statements, form part of the play itself. This distinction is often confusing to the beginner, so I'll start by giving a summary of Basic's commands.

Basic Commands

Load—The script resides on a disk, and you wish to use it. Get it from the library and install it within the machine so it's available.

Save—You're finished with the script for the time being. Prepare a permanent copy (on a disk) so it will survive until next time.

Verify—You've just saved such a copy and want to be sure that it is a good one before you turn off the power.

List—The script is in the computer's memory area. We want to have a look at it. It's probably time for some revisions to the script before opening night.

Run—House lights down; open the curtain. It's time to perform the play and see how it comes out. Now you're not just the playwright; you assume the director's role and want some action!

RUN It Right

C-64; C-128 (In C-64 mode)

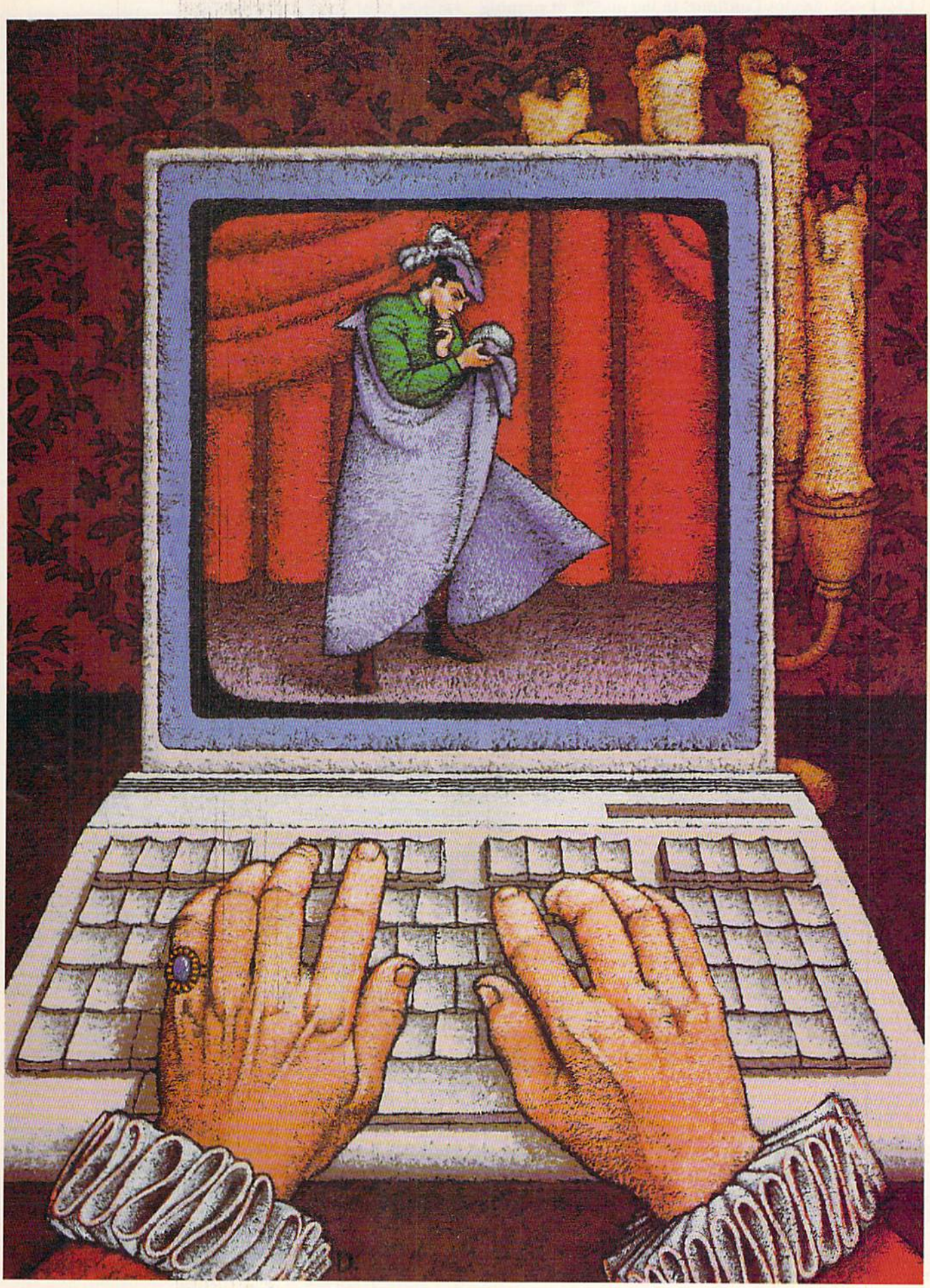


Illustration by Sharon Drinkwine

CONT—Stands for Continue. In the middle of running the program, you paused the play for intermission. Resume the action from where you left off.

New—You don't want to work on this play any more, so forget it. (You did save a copy first, didn't you?) Clear the set to get ready for the next play's opening.

These commands are found in all versions of Basic and will cover the minimum needs. Some dialects have additional commands. For instance, Basic 4.0 (PET/CBM) adds commands (and instructions) for the convenience of working with the disk drive. Basic 7.0 for the Commodore 128 includes these and others to help you with your program editing. Many commercial packages, and public domain ones, too, have Basic enhancements.

Basic Instructions

The rest of this article will introduce the main programming instructions that you'll encounter. You will use these *inside* your programs, as part of the script.

As you embark on this programming tour, please perform the preparatory step of typing the New command after you have finished with any program. This allows you to start each time with a clean slate. It's truly spooky to have an old program instruction haunting a new program. And don't forget to press the return key, or the computer will never "see" your entry.

All the programs will be shown in uppercase text. If the power-up message is in lowercase, simultaneously press the Commodore and shift keys. If you really prefer lowercase, just remember not to use the shift key when entering the text.

While most of us stress the importance of well-organized programs, most of us also desire instant results. Let's just assume that we will supply all the information needed (input) and eliminate the need for calculation (processing). That way, we can concentrate on the results (output).

Basic has but one output keyword, called Print. Naturally we will need it to handle many possibilities. So, Print has several options to handle the job.

Enter the following program:

```
300 PRINT "FRIENDS, ROMANS, COUNTRYMEN..."
310 PRINT 3.14159
320 PRINT "COL 1 " ; "COL 2 " ; "COL 3 "
330 PRINT -1 ; 2 ; 3
340 ? "COL 1 " , "COL 2 " , "COL 3 "
350 PRINT 10 , 20 , -30
```

When you make a typing mistake, use the delete key to erase it or hit the return key and retype the line.

Enter the List command, and your script should read the same as the above. If it doesn't, make the corrections (don't forget to press the return key) and reissue the List command until it does. If a stray, incorrect line number is there, just enter that number on a new line and press the return key. When you reenter the List command, the old line will have magically disappeared.

Perhaps you have noticed that the "?" character in line 340 refuses to stay that way after you issue the List command. The "?" character is an abbreviation for PRINT, and when a program is listed, it always translates it into the written word.

As you recall, the List command just redisplays the script, showing line numbers and Basic instructions. You haven't yet *performed* the play by issuing the Run command. Do that now, and you should see this on the screen:

```
FRIENDS, ROMANS, COUNTRYMEN...
 3.14159
COL 1 COL 2 COL 3
-1  2  3
  COL 1         COL 2         COL 3
    10            20           -30
```

There's a lot here for discussion. Observe first that the line numbers, instructions and punctuation (quotes, semicolons and commas) are not displayed when a program is run. When you run a program, the computer performs the Basic instructions; it does *not* repeat them.

Notice line 300. The characters are enclosed in quotation marks. This is called a "string." A string can include numbers, punctuation and special symbols—a string of characters, literally. If you want such characters to be printed out, they must be enclosed in quotation marks.

If you are performing operations with numbers, you do not need to enclose them in quotes. Look at the result of line 310, and you will note that a space character precedes the first digit. Even if the number is not negative, space for a sign is always provided.

The first two program lines caused the results to be placed on separate lines. You may sometimes want to list several items side by side, on the same line. In the above program, lines 320–350 accomplish this through the use of semicolons and commas. Semicolons create a smaller space between items, or fields, and commas create a larger space. (In fact, the columns in lines 340 and 350 are ten characters wide, like preset tabs on a typewriter.) If the information doesn't fit within the ten spaces allowed, then the next tab setting (multiples of ten spaces) would be used.

You may mix and match amongst string literals, numbers, semicolons and commas, all on the same output line. Add the following line to the program, then run it.

```
360 PRINT 100 ; "DEGREES C =" , 212 ; "DEGREES F"
```

A semicolon or comma at the end of a Print statement line will suppress the normal carriage return, so the output from the next Print statement will be shown on the same line. Add the following lines to the program; then run them.

```
370 PRINT -40 ;
380 PRINT "DEGREES F =" ,
390 PRINT -40 ;
400 PRINT "DEGREES C"
```

That's about it for the Print statement. I would encourage you to try several examples of your own creation before proceeding to the next topic. Understanding the flexibility of the Print statement will allow you to make your program displays look quite slick.

1 Plus 1 Is 2

Let's take a slight detour here, to review a few rules of arithmetic. Addition (+) and subtraction (−) signs are as expected, but the symbols for multiplication (*) and division (/) differ from the usual convention.

Algebraic logic, where multiplication and division are performed before addition and subtraction, applies. Parentheses are used to force operations to be done in a specific order. The calculations are done in a left-to-right order, with operations in parentheses being performed first.

Type NEW to clear the program memory, then enter the lines below.

```
300 PRINT "1 + 1 =" ; 1 + 1
```

Circle 406 on Reader Service card.

IF YOU CAN FIND A BETTER PROGRAM WE'LL BUY IT FOR YOU!*

WORD WRITER with Spell Checker

Now with 85,000 word Spelling Checker

- An efficient, 80-column professional word processing system which includes a spelling checker and built-in calculator.
- Contains all the features you'll need for everyday word processing, plus most of the sophisticated features found in more expensive programs: document chaining, form letter printout, page separations, horizontal and vertical scrolling, and more.

With Timeworks you get more power for your dollar

You can use each program alone. Or interface this trio – one at a time if you like – into a completely integrated productivity system that delivers all the power and features most of you will ever need . . . at a cost that lets you enjoy their use.

Look for these and other Timeworks programs at your favorite dealer. Or contact Timeworks, 444 Lake Cook Road, Deerfield, IL 60015. Phone: (312) 948-9200.

DATA MANAGER 2

Faster, more efficient, more versatile

- A complete general information storage and retrieval system with report-writing, graphics, statistics, and label-making capabilities.
- Exclusive X-SEARCH, X-SORT, and X-CHART features allow you to cross-search any category of information; sort items alphabetically, numerically, or by date; break down statistical information into categories; and graphically view your results.

With Timeworks you get more than software

You Get Our Customer Technical Support Team

At the other end of our toll-free hotline, you'll find our full-time Customer Technical Support Team. Free of charge to all registered users.

You Get Our Liberal Trade-Up Policy

You'll find the details inside each package.

SWIFTCALC with SIDEWAYS

New easy-to-use spreadsheet for home and small business use

- The SIDEWAYS option lets you print all your columns on one, continuous sheet . . . sideways.
- 250 rows and up to 250 columns (128K version) provide up to 62,500 cells (locations on the spreadsheet) in which to place information.
- Performs mathematical functions up to 17 digits. Allows the use of minimum and maximum values, averages, sums, integers, absolute values and exponential notation.

*With Timeworks you get our Money Back Guarantee

If you can find anything that works better for you, simply send us your Timeworks program, your paid receipt, and the name of the program you want, along with your check or credit card number for any retail price difference. If it's available, we'll buy it for you.**

For Apple, IBM, Commodore 128 (128K) & Commodore 64 Computers

TIMEWORKS®

More power for your dollar.

Other Timeworks Programs:

- The Evelyn Wood Dynamic Reader
- Sylvia Porter's Personal Finance Series
- Swiftax ■ Cave of the Word Wizard
- Business Systems ■ Wall Street
- The Electronic Checkbook
- The Money Manager

These programs interface with each other

Now available for Commodore 128

** Offer valid for 90 days from date of purchase.

*** Registered trademarks of Apple Computer, Inc., International Business Machines Corporation, and Commodore Computer Systems

© 1985 Timeworks, Inc. All rights reserved.

```
310 PRINT "14 - 3.96 =" ; 14 - 3.96
320 PRINT "2 * 6 =" ; 2 * 6
330 PRINT "3 / 7 =" ; 3 / 7
340 PRINT "2 + 3 * 6 =" ; 2 + 3 * 6
350 PRINT "(2 + 3) * 6 =" ; (2 + 3) * 6
```

Observe the use of string literals in each line. That way, both the problem and the answer will be printed out.

The operation priority is demonstrated in lines 340 and 350. Try to understand the computer's answer before you proceed. You could have enclosed the 3 * 6 in parentheses (line 340), but it was unnecessary. Retype this line with parentheses (and run it) to see for yourself. If you're not sure which operation the computer will do first, you are free to add parentheses—no harm done. And you're not limited to using a single pair. The computer can handle many pairs, all nested within each other. Don't use [] or <>, as they do not function as parentheses.

One last point: In line 350, you could write "(2 + 3)6" if this were algebra instead of Basic. However, you cannot omit the multiplication sign in Basic.

A Little Painless Algebra

Many people develop an aversion to algebra in high school. This won't be all that painful, and I promise not to use x for the unknown quantity. We can't do without a little algebra in Basic. Programming involves problem solving, so you'll have to use symbols to represent quantities that you haven't yet determined. This is the role of "variables" in Basic.

You can use single letters of the alphabet to represent little compartments that can hold one number at a time. This cell can represent a number value as large as 10 to the 38th power (1 followed by 38 zeroes) or as small as 1 divided by 10 to the 38th power. The numbers are accurate to about nine digits.

The values held in these compartments, or boxes, can change. You assign values using Basic instructions. In fact, there are only three such instructions: Let, Input and Read. Each has its benefits and drawbacks, so there's a place for each in a program.

In previous examples, you knew the values in advance, so no input section of the program was required. You also didn't perform any calculations, hence no processing section. Variables give you the power to do more useful work with a program.

The Let statement is used for both input of values and processing, as in the example program:

```
100 LET A = 4
110 LET B = 8
200 LET C = A * B
300 PRINT , "ARITHMETIC"
310 PRINT
320 PRINT "ANSWER IS" ; C
```

The first line assigns a box, labeled A, to hold a number. The value 4 is put there. Line 110 does the same for B, storing "8" there. This completes the input phase, as you have the necessary values for the calculation.

Line 200 represents the processing. Take the contents of box A and multiply by the contents of box B. Create a box C to hold the answer, and put that value in it. Note that line 200 does not depend on numbers; it simply looks in boxes A and B, takes whatever is there and uses it to find what to put into box C. Hence the name "variable," as the answer can *vary*, depending on what was found in box A and box B.

The output section has a title, followed by a blank line. Line 320 is also independent of boxes A and B, as it reports only what was stored in box C.

Run the program to see the results. Only the final answer is shown—the starting values and the calculation are invisible to you. To show the values used, you have to write the program instruction yourself. Add this line:

```
315 PRINT A ; "TIMES" ; B
```

When you run it again, you will see the improvement. Once again, you've used the variable *names*, rather than their *values*.

All this is leading up to the issue of generality. A program that multiplies 4 by 8 is not very practical after the first time through. If you could vary the starting values, it would be more useful. How can this be done? Type in a new line 100.

```
100 LET A = 3.14159
```

Run it again, and you'll see the effect. Change line 100 to some other value for variable A. Do the same for B in line 110. Don't forget to run each of the versions you made.

Did you need to change any other lines in the program to make it come out right? Why not? Because lines 200, 315 and 320 refer to the *contents* of box A, box B and box C. If you change box A, box B, or both, then all the rest is performed automatically. This is the essence of programming: If you find a way to change the input values, then the processing and output stages survive without alteration.

Try this example:

```
100 LET FAHRENHEIT = 212
200 LET CELSIUS = 5 / 9 * (FAHRENHEIT - 32)
300 PRINT , "TEMPERATURE CONVERSION"
310 PRINT
320 PRINT "DEG. F" , "DEG. C"
330 PRINT FAHRENHEIT , CELSIUS
```

This one looks a shade more interesting. If line 100 defines a value for the variable FAHRENHEIT, then line 200 can use this value in its formula. Since this is the correct formula for the conversion, the variable CELSIUS will hold the Celsius equivalent. Line 330 takes the contents of the two boxes and displays them side by side.

Now change the Fahrenheit value in line 100 to −40. You needn't make any other changes to the program, as the conversion continues to be correct. Again, it should be stressed that variables used in the processing and output sections make this possible.

With two precautions, you may use longer names, rather than single letters, for the variables. Basic reserves certain words for its own use, and a long name may tread on one. For example, the following program would contain Syntax errors.

```
100 LET FORD = 99408
110 LET CHEVROLET = 153303
120 LET CHRYSLER = 102477
200 LET TOTAL = FORD + CHEVROLET + CHRYSLER
300 PRINT "TOTAL CARS =" ; TOTAL
```

With your knowledge of Basic so far, you might notice in line 110 the word LET (within CHEVROLET). Because this is also a Basic keyword, the computer will interpret it as such and give you a Syntax error. Also, FOR and TO (embedded in FORD and TOTAL) are Basic keywords and will cause trouble.

The second caution in using longer variable names can be demonstrated by the following.

A Printer For All Reasons

Search For The Best High Quality Graphic Printer

If you have been looking very long, you have probably discovered that there are just too many claims and counter claims in the printer market today. There are printers that have some of the features you want but do not have others. Some features you probably don't care about, others are vitally important to you. We understand. In fact, not long ago, we were in the same position. Deluged by claims and counter claims. Overburdened by rows and rows of specifications, we decided to separate all the facts — prove or disprove all the claims to our own satisfaction. So we bought printers. We bought samples of all the major brands and tested them.

Our Objective Was Simple

We wanted to find that printer which had all the features you could want and yet be sold directly to you at the lowest price. We didn't want a "close-out special" of an obsolete product that some manufacturer was dumping, so we limited our search to only those new printers that had the latest proven technology. We wanted to give our customers the **best** printer on the market today at a bargain price.

The Results Are In

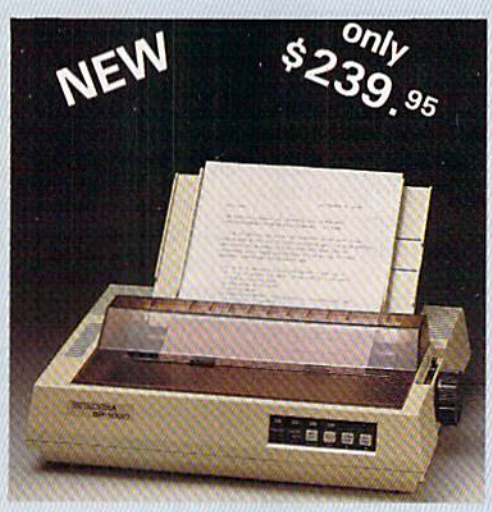
The search is over. We have reduced the field to a single printer that meets all our goals (and more). The printer is the SP-1000 from Seikosha, a division of Seiko (one of the foremost manufacturers in the world). We ran this printer through our battery of tests and it came out shining. This printer *can* do it all. Standard draft printing at a respectable 100 characters per second, and with a very readable 12 (horizontal) by 9 (vertical) character matrix. This is a full bi-directional, logic seeking, true descender printer.

"NLQ" Mode

One of our highest concerns was about print quality and readability. The SP-1000 has a print mode termed Near Letter Quality printing (NLQ mode). This is where the SP-1000 outshines all the competition. Hands down! The character matrix in NLQ mode is a very dense 24 (horizontal) by 18 (vertical). This equates to 41,472 addressable dots per square inch. Now we're talking ***quality*** printing. It looks like it was done on a typewriter. You can even print graphics using the standard graphics symbols built into your computer. The results are the best we've ever seen. The only other printers currently available having resolution this high go for hundreds more.

Features That Won't Quit

With the SP-1000 your computer can now print 40, 48, 68, 80, 96, or 136 characters per line. You can print in ANY of 35 character styles including 13 double width and 3 reversed (white on black) styles. You not only have the standard Pica, Elite, Condensed and Italics, but also true Superscripts and Subscripts. Never again will you have to worry about how to print H_2O or X^2. This fantastic machine will do it automatically, through easy commands right from your keyboard. Do you sometimes want to emphasize a word? It's easy, just use **bold** (double strike) or use *italics* to make the words stand out. Or, if you wish to be even more emphatic, underline the words. You can combine many of these modes and styles to make the variation almost endless. Do you want to express something that you can't do with words? Use graphics with your text — even on the same line. You have variable line spacing of 1 line per inch to infinity (no space at all) and 143 other software selectable settings in between. You can control line spacing on a dot-by-dot basis. If you've ever had a letter or other document that was just a few lines too long to fit a page, you can see how handy this feature is. Simply reduce the line spacing slightly and ... VOILA! The letter now fits on one page.



Forms? Yes!
Your Letterhead? Of Course!

Do you print forms? No problem. This unit will do them all. Any form up to 10 inches wide. The tractors are adjustable from 4 to 10 inches. Yes, you can also use single sheets. Plain typing paper, your letterhead, short memo forms, labels, anything you choose. Any size to 10" in width. In fact this unit is so advanced, it will load your paper automatically. Multiple copies? Absolutely! Use forms (up to 3 thick). Do you want to use spread sheets with many columns? Of course! Just go to condensed mode printing and print a full 136 columns wide. Forget expensive wide-carriage printers and changing to wide carriage paper. You can now do it all on a standard 8½" wide page, and you can do it quietly. The SP-1000 is rated at only 55 dB. This is quieter than any other impact dot matrix printer that we know of and is quieter than the average office background noise level.

Consistent Print Quality

Most printers have a ribbon cartridge or a single spool ribbon which gives nice dark printing when new, but quickly starts to fade. To keep the printers output looking consistently dark, the ribbons must be changed quite often. The SP-1000 solves this problem by using a wide (½") ribbon cartridge that will print thousands of pages before needing replacement. (When you finally do wear out your ribbon, replacement cost is only $11.00. Order *#2001.)*

The Best Part

When shopping for a printer with this quality and these features, you could expect to pay much more. *Not now!* We sell this fantastic printer for **only $239.95! You need absolutely nothing else to start printing — just add paper (single sheet or fanfold tractor).**

No Risk Offer

We give you a 2-week satisfaction guarantee. If you are not completely satisfied for any reason we will promptly refund your purchase. The warranty has now been extended to 2 years. The warranty repair policy is to repair or replace and reship to the buyer within 72 hours of receipt.

The Bottom Line

Be sure to specify the order # for the correct version printer designed for your computer.

Commodore C-64 & C-128, Order #2200, graphics interface & cable built in.

IBM-PC and compatibles, Order #2100, plus 8' shielded cable #1103, $26.00

Standard Parallel with 36 pin Centronics connector, Order #2400, no cable

Standard Serial with RS-232 (DB-25) Connector, Order #2500, no cable

We also have interfaces and cables for many other computers not listed. Call Customer Service at 805/987-2454 for details.

Shipping and insurance is $10.00 — UPS within the continental USA. If you are in a hurry, UPS Blue (second day air), APO or FPO is $22.00. Canada, Alaska, Mexico are $30.00 (air). Other foreign is $70.00 (air). California residents add 6% tax. The above are cash prices — VISA and MC add 3% to total. We ship the next business day on money orders, cashiers' checks, and charge cards. A 14-day clearing period is required for checks.

Dealer inquiries invited
For information call 805/987-2454

TO ORDER CALL TOLL FREE
1-(800) 962-5800 USA
1-(800) 962-3800 CALIF. (8-6 PST)

or send order to:

APROTEK
1071-A Avenida Acaso
Camarillo, CA 93010

```
100 LET APPLES = 2
110 LET PEACHES = 4
120 LET PEARS = 3
200 LET FRUITSALAD = APPLES + PEACHES + PEARS
300 PRINT "TOTAL FRUITS =" ; FRUITSALAD
```

Enter and run this to see if you can understand the answer. Basic looks only at the first two characters of a name to distinguish it. PEACHES and PEARS match, so line 120 redefines variable PE, causing the value in line 110 to be lost forever.

Defining Variables Quickly

The above two shortcomings are addressed by the Input statement. While the Let statement has its place, the Input statement may be used to advantage in many circumstances. Try this program:

```
100 LET RADIUS = 10
200 LET CIRCUMFERENCE = 3.14159 * RADIUS * 2
300 PRINT "IF RADIUS = " ; RADIUS
310 PRINT "CIRCUMFERENCE = " ; CIRCUMFERENCE
```

Run it and then change values for the radius. Clumsy, isn't it? Now make the following change to the above.

```
100 INPUT RADIUS
```

When run, the program comes to a screeching halt, yielding nothing but a cryptic question mark and the cursor blinking away to its right. The question mark is meaningful—the program is waiting for you to supply a value. Provide a number (your choice), and after you have hit the return key, the action is completed. If you run it again, you get to choose again, and so on.

The Input statement causes the value you give to be assigned to the variable box named RADIUS. Then the contents of that box are used by the rest of the program, just as before. Now the program does not depend on a preselected value; the computer lets you supply one for which you wish an answer.

Suppose you or someone else uses this program at a later date; how will you know which value is expected? Let's add another line to prompt the forgetful or uninformed user of your program:

```
90 PRINT "ENTER THE RADIUS" ;
```

Now a helpful message, called a prompt, tells what to supply. For a shorter, combined form, omit line 90 and retype this:

```
100 INPUT "ENTER THE RADIUS"; RADIUS
```

For some reason, you cannot leave a space after the closing quotes (before the semicolon), though spaces are almost always ignored by Basic.

The Goto Statement

Computers can do repetitive tasks well. Pretend you have a long list of radius values that require circumference answers. Add the following lines to the latest version.

```
320 PRINT
400 GOTO 100
```

Now run the program, and you'll see an endless loop in action. Every time you supply a value, you receive the answer, and then another question! The stop key is ineffective while the computer is waiting for an Input response. To exit the program, simultaneously press the run/stop and restore keys.

The Goto statement must be followed by some line number in the program. It is referred to as a "branching" instruction because it changes the order in which the lines are executed. In this case, the branch is *unconditional*, since every time the program arrives at line 400, it is sent to line 100.

Keep a copy of the final version of this program. We'll refer to it later.

Entering Text

Variables are needed when referring to text information. For a fill-in-the-blank form letter, try the following program.

```
100 PRINT "FORM LETTER"
110 PRINT
120 INPUT "DATE"; D$
130 INPUT "FIRST NAME"; F$
140 INPUT "LAST NAME"; L$
150 INPUT "CITY"; C$
160 INPUT "STATE"; S$
170 INPUT "KIDS' NAMES"; K$
200 PRINT
210 PRINT , , D$
220 PRINT
230 PRINT "DEAR " ; F$;
240 PRINT
250 PRINT " HOW ARE THE " ; L$ ; "'S OF THE ";
260 PRINT "GRAND OLD STATE OF " ; S$ ; " THIS YEAR ?"
270 PRINT
280 PRINT " THINGS ARE QUIET IN BARRIE, BUT I " ;
290 PRINT "BET YOU ARE BUSY IN " ; C$ ; "."
300 PRINT
310 PRINT " ANDREA AND MICHAEL ARE FINE. " ;
320 PRINT "HOW ABOUT " ; K$ ; "?"
330 PRINT
340 PRINT " MERRY CHRISTMAS,"
350 PRINT "                    THE HOOKS."
360 PRINT
```

When you run this, you'll be asked to provide six items, which can include alphabetic, numeric and special characters. (Do not use commas, colons or double quotes in your response—they confuse Basic, and you'll get strange results.) The data you have typed will then be used in the form letter. If the output had been directed to a printer, you could have printed your letter. To generate another letter to someone else, simply reissue the Run command and input new data.

As with number variables, no other changes to the program are required. New string information brings you another finished letter. If a variable is followed by $ (for example, D$), you have a string variable. You cannot do arithmetic with these.

String variables can contain up to 255 characters. They can be assigned in Let statements, too:

```
100 LET A$ = "COMMODORE"
110 LET B$ = "LIKE"
120 LET C$ = "I"
300 PRINT C$ ; " " ; B$ ; " " ; A$
```

The quotation marks surrounding the string definition are essential. Otherwise a Type Mismatch error occurs. The quotes make LIKE into a string literal—similar to those used in Print statements. Now a string of characters is assigned to a string variable. Note how strings are spaced when semicolon punctuation is used. Drop the extra spaces in line 300 and see what happens.

Decisions, Decisions

We have had an example of a loop already, although it was a clumsy one that needed unusual steps to abort. Using the If. . .Then statements, you can streamline this process.

Circle 419 on Reader Service card.

It's Absolutely Shocking!!!

After all these years, CMS Software Systems is still the only company providing professional quality accounting software for the complete line of Commodore business computers.

Whether you own an 8032, 8096, SuperPET, B-128, C-64, or the new C-128, we have a professionally written, fully integrated Accounting System designed especially for you.

Introduced in 1979, the **CMS Accounting System** was the first Accounting System available for Commodore computers. Not satisfied with just being first, we have continued to update, expand, and improve until today, the **CMS Accounting System** is widely recognized as one of the finest Accounting Systems available for any computer.

Now Available for the Commodore C-128

- General Ledger
- Accounts Receivable
- Billing
- Accounts Payable
- Job Costing
- Payroll

$179.95
Complete Price

For more information see your Commodore dealer or call Cathy York at 214/289-0677.

CMS Software Systems, Inc. • 2204 Camp David • Mesquite, TX 75149

Reload the copy of the radius/circumference program that you saved. Add the following lines.

```
110 IF RADIUS = 0 THEN 500
500 END
```

The End statement terminates a program. It is usually optional, though it is sometimes required. To be on the safe side, I suggest you always include it in your programs.

List the program. After the radius has been input, you are testing it to see if a zero has been entered. If a zero has been entered, making the test true, then the program skips to line 500. The line number following THEN is the destination if the test is true. Any other value for the radius allows the program to continue, just as if no test had been done. Thus, the false result of the test points at the next line number.

The above example is a *conditional* branch, meaning that the branch is performed only if the test succeeds. In place of the Then statement, you may use Goto or THEN GOTO.

The following two lines create a prompt that allows you to stop the program.

```
90 PRINT "ENTER '0' TO STOP"
95 PRINT
```

Relational Operators

The line:

```
IF RADIUS = 0 THEN 500
```

is based on an "equals" condition. You can test for six conditions in all:

>	greater than
<=	not greater than (less than or equal to)
<	less than
>=	not less than (greater than or equal to)
<>	not equal to
=	equal to

The symbols are called relational operators because they compare two relations. The expression on either side of the operators can consist of constants and variables (numeric comparisons) or string literals and variables (string comparisons). The following program uses both types.

```
90 PRINT
100 PRINT , "MENU"
110 PRINT
120 PRINT "1. — START A NEW FILE"
130 PRINT "2. — ADD A NAME"
140 PRINT "3. — QUIT"
150 PRINT
160 INPUT "CHOOSE A NUMBER (1, 2 or 3)"; NUMBER
165 PRINT
170 IF NUMBER < 1 THEN 160
180 IF NUMBER > 3 THEN 160
190 IF NUMBER = 1 THEN 1000
200 IF NUMBER = 2 THEN 2000
210 IF NUMBER = 3 THEN 3000
220 END
1000 PRINT "START A FILE SECTION"
1010 PRINT
1900 GOTO 5000
2000 PRINT "ADD A NAME SECTION"
2010 PRINT
2900 GOTO 5000
3000 PRINT "QUIT SECTION"
3900 END
5000 INPUT "ARE YOU DONE (Y/N)"; ANSWER$
5010 IF ANSWER$ = "N" THEN 90
5020 IF ANSWER$ <> "Y" THEN 5000
5030 END
```

This program is typical of a "menu" type that you have probably used before. The choices are offered, and the Input statement waits for a numeric response. Lines 170 and 180 send you back to the question unless you give an answer within the correct range. Then you are sent to one of three distinct sections, corresponding to the menu selection.

If someone enters 1.3 or another illegal value in line 160, then line 220 ends the program.

Once you have arrived at the correct section, a message is printed to signal what happened. If you choose to quit, the End instruction terminates the program. Otherwise, you may create or add to the file (not included here). After that, you are sent to line 5000, where you are asked another question.

Here the response is alphabetic, so a string variable is needed. An N sends you back to the menu. A Y sends you to line 5030, where the program ends. If you don't answer Y in line 5020, then the program returns to line 5000 and asks you again whether you are done.

In the example program, once the correct branch is taken, you must isolate that section from the others. Segments at lines 1000, 2000 and 3000 must never overlap. You can bring the alternate pathways together after the individual task is finished.

What About Data?

The third way of getting information into the computer is through the Read and Data statements. Data statements mark the spot where some information is to be found. Several items (numbers or strings) can appear on the same line, separated by commas. These items just sit there, waiting for the Read statement to pick them up as needed. Thus, Data statements can appear anywhere in a program, even after an End statement, and Read will still find them. Data is read from left to right, from the lowest line number containing data to the highest.

Let's look at an example:

```
100 PRINT "NAME" ; TAB(14) ; "AT BAT " ;
110 PRINT "HITS" ; TAB(29) ; "AVERAGE"
120 READ NAME$
130 READ ATBATS , HITS
200 LET AVERAGE = HITS / ATBATS
300 PRINT NAME$ ;
310 PRINT TAB(14) ; ATBATS ;
320 PRINT TAB(21) ; HITS ;
330 PRINT TAB(27) ; AVERAGE
400 GOTO 120
1000 DATA "MULLINIKS",244,81
1010 DATA "IORG",156,49
1020 DATA "OLIVER",70,21
1030 DATA "GARCIA",441,127
1040 DATA "BELL",404,115
1050 DATA "WHITT",261,72
1060 DATA "BURROUGHS",151,41
1070 DATA "FERNANDEZ",367,98
1080 DATA "BARFIELD",350,91
1090 DATA "UPSHAW",376,97
1100 DATA "MOSEBY",375,89
```

Lines 100 and 110 contain the Tab function, which lets you use a numeric value for the placement of the next field on the screen. If comma and semicolon punctuation is inadequate, you can use Tab values to set up the next column position. Don't forget to enter the semicolon after

HOW TO GET OVER $2000 WORTH OF NEW CAPABILITIES FOR YOUR COMMODORE 64™

FOR $599*

The Spartan™ is the Apple™ II+ emulator for your Commodore 64™ that will open up a whole new world of hardware and software for you! Imagine adding these features to your Commodore 64™ for the Spartan™ price of $599: ☐ Apple™ II+ hardware and software capabilities ☐ 64K RAM expansion ☐ four software selectable Commodore 64™ cartridge slots ☐ non-dedicated 8-bit parallel port ☐ standard audio cassette deck capabilities for your C-64™. The suggested retail value of comparable products offering only these capabilities is over $2200.00* — but the Spartan™ gives you much, much more! By building on your investment in your Commodore 64™— an excellent introductory computer — you create a whole new system with both C-64™ and Apple™ II+ capabilities. There is a whole other world out there! The huge selection of Apple™ II+ hardware and software is now yours to explore! Call toll free for the Spartan™ dealer nearest you.

*All prices quoted are in U.S. funds, freight and taxes not included. Value of components equivalent to the Spartan™ system are quoted from Apple™ II+ CPU and Apple™ II+ single disk drive 1983 list prices, and from current suggested list prices and component specifications of other peripheral manufacturers. Commodore 64™ and Commodore logo are trademarks of Commodore Electronics Ltd. and or Commodore Business Machines, Inc. Apple™ II+ is a trademark of Apple Computer Inc. Spartan™ is a trademark of Mimic Systems Inc. and has no association with Commodore Electronics or Apple Computer Inc. The Spartan™ is manufactured by Mimic Systems Inc. under license granted by ATG Electronics Inc. of Victoria, B.C. Canada.

MIMIC

FOR INFORMATION WRITE:
MIMIC SYSTEMS INC.
1112 FORT ST., FL. 6A
VICTORIA, B.C.
CANADA V8V 4V2

TO ORDER CALL:
1-800-MODULAR
(663-8527)

Circle 401 on Reader Service card.

TAB(29) in line 110, or else the heading will take up two screen lines.

The Read statements in the next two lines pick up the three fields of information from the first Data statement. The string variable, NAME$, gets the first item (MULLINIKS), and the number variables get the next two data items. Note that the data must be organized in the same order as the Read statements. Basic doesn't know which data goes with which variable—it just matches them as they come up.

A variable, AVERAGE, is established to hold the result of the calculation. Then the four variables are printed in evenly spaced columns. The Goto statement returns program control to line 120.

What happens next is significant. The *same* Read statement now reads *new* data, reusing the *same* variable names. Now the NAME$ variable retrieves IORG, and his two numbers go into ATBATS and HITS.

The process continues until there is no more data to process, then it quits with an error message. You can make it tidier by adding the following lines to the program:

```
125 IF NAME$ = "DUMMY" THEN 500
500 END
9999 DATA "DUMMY",0,0
```

Now, every time another name is read into NAME$, a check is done to see if it matches DUMMY. When it does, the program stops reading data. You must remember to include this special Data statement at the end of your program. This name isn't processed; it is merely a trigger to end the reading of data.

You could use Input in the above example by changing the Read statements. Then you must type in the data for every player every time you run the example. On the other hand, you would not want to use the Let command, since you would have to change the program for every player (e.g., LET NAMES$ = "MULLINIKS"). Read/Data is the method of choice in instances where the Data values are known before the program is run and several cases must be handled.

There is a way to reuse the same list of data. The Restore statement resets the pointer, allowing the next Read statement to read the data again, from the first item. Enter the following program, *without* entering NEW first. Then list it and get rid of any statements that don't belong. This saves you the trouble of typing all the data again.

```
100 INPUT "PLAYER TO FIND "; PL$
110 RESTORE
120 READ NAME$
130 IF NAME$ = "DUMMY" THEN 500
140 READ ATBATS , HITS
200 IF NAME$ <> PL$ THEN 120
210 LET AVERAGE = HITS / ATBATS
300 PRINT NAME$ ; ATBATS ; HITS ; AVERAGE
310 PRINT
320 GOTO 100
500 PRINT "NAME NOT FOUND"
510 PRINT
520 GOTO 100
```

Now you are asked to give a player's name. If it is found in the data, the batting average will be calculated and the four fields will be displayed. The data will be exhausted in the loop between line 120 and line 200. The Restore statement in line 110 makes the whole list available for the next inquiry.

REM Statements

The Remark, or REM, statement lets you provide information or briefly document sections of your program. A REM statement can serve as a quick reminder of what you were trying to accomplish in a given area. The statements appear only when the program is listed. An example of some initial REM statements follows.

```
10 REM TAX PROGRAM — VERSION 2.01
20 REM AS OF AUGUST 9, 1985
30 REM D. A. HOOK, BARRIE, ONT., CANADA
50 REM — LIST OF VARIABLES —
55 REM I.....INCOME
60 REM T.....TAX DEDUCTED
199 REM DISPLAY MENU
```

Here, REM is used to identify the program, its version number and the date of last revision. As you program, you may end up with 17 versions of Blackjack, spread all over your disk library. When you go on a housekeeping blitz, this is a convenient way of keeping track of the most recent version. If you copied a program from a magazine, include the author's name and where it came from. That information will come in handy a year later, when you've forgotten what a particular program does.

Perhaps the two most useful benefits of REM are identification of the names of important variables, since Basic limits the length of variable names, and the identification of sections of the program (purpose of a routine or explanation of a clever trick).

For. . .Next Looping

You already know how to branch out of loops by using a dummy value with the If. . . Then statements. There are, however, many cases where you know the starting and ending values ahead of time, and how that value is to change each time through. Consider:

ULTRABYTE
DISK NIBBLER
VERSION 2.0

TOP - RATED COPIER
DRAMATICALLY IMPROVED

INFO - 64 Magazine, June 1985, compared Commodore 64 copy programs and awarded the Nibbler its highest rating. Now the Nibbler has been improved to copy dozens of the latest programs that previously could not be copied, all in less than three minutes.

FOR SINGLE 1541 & DUAL MSD DRIVE

- Simple. Even a beginner makes perfect copies
- Fast. Copies protected disks in three minutes
- Sophisticated. Senses the disk being copied and automatically adjusts for dozens of protection schemes. Copies 99 + % of software
- Modular design to allow easy updates
- Even copies itself. For this reason, no refunds will be given

$ 39.95 plus $ 4.00 shipping & handling.

Mastercard, Visa, Check or M.O., Calif. add 6.5% ($2.60) sales tax.
Foreign orders or COD add $2.00. Payment must be in U.S. funds.
Previous customers may order V 2.0 for $20.00 plus $4.00 shipping

NIBBLER V 2.0 EVEN COPIES ITSELF

To order, write or call 24 hr. order line
For information, write. Phone for orders only

ULTRABYTE (818) 796 - 0576
P.O. Box 789 La Canada, CA 91011 USA

DEALERS & DISTRIBUTORS WANTED

```
300 PRINT "COUNTDOWN..."
400 FOR I = 10 TO 0 STEP -1
410 PRINT I
420 NEXT I
500 PRINT "BLAST OFF!"
```

The variable I is an index counter, defined to start at ten and finish at zero, counting backwards by 1. The end of the loop is marked by line 420, where the value of the index counter is checked. If it has not passed its ending value, everything between the FOR (line 400) and the NEXT (line 420) is performed again. After all permissible values of I have been handled, the loop exits at the bottom and processing continues with the next instruction.

Here is a delay loop that counts to 5000 while processing occurs.

```
200 FOR COUNT = 1 TO 5000
210 NEXT COUNT
220 REM RESUME PROGRAM AFTER DELAY
```

Here, COUNT is the index of the loop, and we want it to go from 1 to 5000. Since no STEP is mentioned, we will count upward by 1 each time. There is nothing between the FOR and NEXT lines, so the computer just counts, then exits. On the C-64, this process takes about 8.3 seconds. If you wish to display something on the screen for a given period, you can place this timing loop after the Print statements. The program will then resume its activity after the loop finishes.

You can use variables for the start, end and step values. This makes the loop extremely flexible. Here's another temperature-conversion program:

```
100 LET LOW = -40
110 LET HIGH = 100
120 LET CHANGE = 10
200 PRINT "DEG. F" , "DEG. C"
210 PRINT
220 FOR FAHRENHEIT = LOW TO HIGH STEP CHANGE
230 LET CELSIUS = 5 / 9 * (FAHRENHEIT -32)
240 PRINT FAHRENHEIT , CELSIUS
250 NEXT FAHRENHEIT
```

Run this, and you will see a whole table of values. Since the Let statements make things rather inflexible, change these three lines:

```
100 INPUT "START TEMP. IN DEG. F"; LOW
110 INPUT "END TEMP. IN DEG. F"; HIGH
120 INPUT "STEP SIZE"; CHANGE
```

Now you're ready to produce a table for any range.

Well, I hope you have been inspired to try some Basic programming on your own. Beyond these core instructions, remember to keep a Basic manual close at hand. I've also provided you with a list of some books you might find helpful. R

Address all author correspondence to David A. Hook, 215 Anne St. North, Barrie, Ontario, Canada L4N 4T4.

References

Armchair Basic by Annie Fox & David Fox. Osborne/McGraw-Hill (1983). Superb introduction for absolute beginners.

How to Program Your COMMODORE 64—BASIC for Beginners by Carl Shipman. HP Books (1983). Excellent, comprehensive book written so that ordinary people can understand.

BASIC and the Personal Computer by Thomas A. Dwyer & Margot Critchfield. Addison-Wesley (1978). Very good, though slightly more technical.

A Bit of BASIC by Thomas Dwyer and Margot Critchfield. Addison-Wesley (1980). A revised and condensed version of the above, with fewer application programs.

Circle 423 on Reader Service card.

Play the new family trivia game set to music!

Remember all the great songs from movies and television when you were growing up? Now your Commodore 64 or 128 is challenging you to name them.

Tunes 'n Trivia, the new game from Sound Software, plays all the old favorites and even some new ones.

Once you or your teammates recognize a melody, you'll still have to deal with the trivia. Miss the easy questions and lose points. Get the tough ones correct and earn a big bonus.

Tunes 'n Trivia even takes an occasional time out for a word from a sponsor. Some of the best ad songs from TV are included for extra points.

Enjoy these special features:

- Up to 4 teams or players.
- Automatic score-keeping.
- No crowding around your computer . . . just one keyboard operator.
- Hundreds of tunes on each disk . . . no repeats.
- Future data disks include Beatlemania; Solid Gold from the 50's and 60's; New Generation hits of the 70's and 80's.

Order Tunes 'n Trivia by phone 24 hours a day. Or send check or money order for $29.95 plus $3.00 shipping and handling. Ohio residents add 5.5% sales tax.

MasterCard VISA

SOUND SOFTWARE, LTD.

221 E. Avondale Ave. Youngstown, OH 44507

1-800-742-6188

Ohio residents only

1-216-742-6188

C-64/C-128 Graphics
You Won't Believe Your Eyes!

By LOUIS WALLACE

When it comes to graphics, both the C-64 and C-128 offer some superb features. The trick is in accessing these features. Using sample programs, this article shows you how, and helps you better understand Commodore graphics programming.

The C-128 and C-64 computers are well-known as high-powered, low-cost graphics systems. They share many graphics features, such as modes, resolution, animation and others. However, they differ radically in how you access these features from Basic. The commands of the C-128's Basic 7.0 support most of the graphics features of the C-128, while on the C-64 those same graphics capabilities must be accessed by Peek and Poke commands or machine language routines. This article will examine the various graphics modes and compare programming methods between the two computers.

Both the C-128 and C-64 have three major types of graphics: text, bit-map and sprites. All of the C-64 graphics (and most of the C-128's) are made possible by the VIC (video interface controller) chip. The C-128 also has a second graphics chip, the 8563, which allows for a higher resolution (80-column) display. This chip requires an RGB monitor to display properly its 640 × 200 resolution graphics, while those produced by the VIC chip can be used with any composite monitor or television set. It is also possible to use the 80-column output on a composite monitor, but the resolution isn't as clear, and the display will feature monocolor, not 16 colors.

Text Modes

To begin, let's look at the normal Text mode of the C-64 and C-128. This is a 40-column by 25-line display, using up to 256 characters in any of 16 colors. The screen, or background, color can also be independently set to any of the 16 colors.

The C-64 and C-128 offer two character sets from which you may choose. One is uppercase/graphics; the other is uppercase/lowercase. These can be toggled by simultaneously pressing the Commodore key and the shift key. The effect is apparent throughout the visible screen, and each character is changed to its counterpart in the other character set. You can also perform this with the Basic Print command.

```
PRINT CHR$(14)
```

will switch the display to lowercase.

```
PRINT CHR$(142)
```

will switch the display to uppercase.

Many of the C-64's and C-128's text features can be controlled by using the Print command. Examples are:

```
PRINT CHR$(147) (clears the text screen)
PRINT CHR$(19) (moves cursor to top-left of screen)
PRINT CHR$(28) (changes text color to red)
```

When you use the Print command, these types of commands can also be included inside the string you wish to print. You can also include cursor-key commands, reverse-on or reverse-off and even INST/DEL. This can be very useful if you need to position text at a specific location, as the C-64 does not have any form of the Print At command for positioning your output.

The C-128's Basic 7.0, however, does have just such a

command—the CHAR command. Normally used for printing text on the high-resolution bit-map display, the CHAR command will also work in Text mode.

```
CHAR <color source>,x,y,string<,reverse flag>
```

Here the color source can be 0 for background and 1 for foreground. The location to print at is given in the x (columns 0–79) and y (rows 0–24) coordinates. The string is any statement up to 255 characters, including color, cursor keys, and so on, when you're in Text mode. The reverse flag is optional, with 0 meaning off and 1 being reverse-on.

The C-128 also has a very powerful form of the Print command, called Print Using. This allows the programmer to output numbers or strings in a fixed way, such as having two decimal places for printing values in dollars-and-cents form. On the C-64, formatting to two decimal places would require:

```
10 A = 123.45678
20 A = (INT(A*100)/100)
30 PRINT "A = ";A
```

On the C-128, formatting to Basic would require two lines:

```
10 A = 123.45678
20 PRINT USING "###.##";A
```

Both programs would give A = 123.45, but the C-128 form is easier and more versatile.

There is more than one form of 40-column Text mode on these computers. Both have Multicolor and Extended-Color Text modes, which give you more flexibility in determining the color of the characters and their backgrounds. Before getting into those, however, it's important to understand more about what exactly defines a character to the computer.

Character graphics on the C-64 and C-128 are formed by an 8 × 8 grid of dots. The dots are actually bits (⅛ of a byte) that are set (turned on) for display or unset (turned off) to show background color. Eight bytes are required to define a character (eight rows of eight bits each). Multiply that by the 256 characters in each character set, and you'll see it takes 2048 (2K) bytes to define each character set in memory.

When you Poke the screen memory with an ASCII value from 0 to 255, the computer looks up, in the character ROM, the location of the proper eight bytes that contain the definition and puts the pattern indicated into the screen cell you Poked.

Multicolor Text

Multicolor Character mode is the second major Text mode on the C-64 and C-128. Here the C-128 is not supported by its Basic 7.0; instead, it, too, relies on the Peek and Poke commands.

In Multicolor Text mode, you may have, in each character cell, up to three different colors, plus background color. This allows for much more interesting-looking text. However, it does have a liability in terms of character resolution.

When you enter Multicolor mode, the number of dots in a cell is cut in half, making the characters 4 × 8 and, thus, somewhat coarser. Probably the most useful aspect of Multicolor Text mode is in designing custom characters. In fact, many of the objects used in games are not sprites at all; they're multicolor custom characters that can be used by themselves or combined to become larger screen objects.

To enable Multicolor mode on the C-64, you set bit 4 of the VIC-II control register at 53270 ($D016) and Poke the colors you want into the proper registers.

```
POKE 53270,PEEK(53270) OR 16 : REM Activate MC mode
POKE 53282,MC1 : REM Multicolor 1
POKE 53283,MC2 : REM Multicolor 2
POKE COLOR RAM,MC3 : REM Multicolor 3
```

To set Multicolor 3, Poke the proper color RAM byte that corresponds to the screen location of the character in which you're interested. RAM is from 55296 to 56295.

To exit Multicolor mode on the C-64, enter POKE 53270 and deactivate bit 4:

```
POKE 53270,PEEK(53270) AND 239
```

On the C-128, you must approach this process somewhat differently. The C-128 operating system is putting data into several of the VIC-II's registers many times a second.

The information is taken from special system locations called shadow registers, which contain the information about the current graphics condition. These locations are 216 and 217 ($D8–$D9) and 2604–2606 ($02AC–$02AE). If you Poke 255 into 216, this automatic mapping of data is stopped, and you can control the VIC-II's registers as in the C-64. You must be careful to maintain the proper values in the other registers.

The following short program shows how to activate the normal character set in Multicolor mode on the C-128. Although most people won't use this, it is helpful to programmers who wish to create multicolor keyboard characters and custom characters. When it is run, you will see a screen of fuzzy-looking, brightly colored characters. This is the normal character set. However, since they weren't designed as multicolor characters (four pixels by eight lines), they appear strange. Anything you type will now be in Multicolor mode until you press the left-arrow key.

```
1Ø REM C128 MULTICOLOR CHARACTERS DEMO
2Ø SCNCLRØ
3Ø C$="ABCDEFGHIJKLMNOPQRSTUVWXYZØ123456789
   Ø+-{LB.}"
4Ø POKE5328Ø,Ø:POKE53281,Ø
5Ø REM C128 SHADOW REGISTERS
6Ø A=PEEK(216):B=PEEK(217)
7Ø C=PEEK(26Ø4):D=PEEK(26Ø5)
8Ø E=PEEK(26Ø6)
9Ø A1=5327Ø: REM NORMAL VIC CONTROL REGISTE
   R
1ØØ B1=216:REM $D8 GRAPHM = $DØ11
11Ø POKE53282,2: REM MULTICOLOR 1
12Ø POKE53283,7: REM MULTICOLOR 2
13Ø FORI=55296TO56295:POKEI,5:NEXT
14Ø FORI=ØTO23:PRINTC$;:NEXT
15Ø POKE B1,255: REM DISABLE SHADOW REGISTE
   RS
16Ø POKE A1,PEEK(A1)OR16: REM TURN MULTICOL
   OR ON
17Ø POKE 26Ø4,C:POKE26Ø5,D:POKE26Ø6,E:POKE2
   17,B: REM{3 SPACEs}RESTORE VALUES
18Ø GETKEY A$
19Ø IF A$="{LEFT ARROW}"THEN21Ø
2ØØ PRINTA$;:GOTO18Ø
21Ø POKE A1,PEEK(A1)AND 239:POKE216,A:REM M
   ULTICOLOR MODE OFF, VIC RESTORED
22Ø END
```

For C-64 multicolor characters, type in the next program, which also fills the screen with multicolor characters. It allows you to vary their colors by pressing f1, f3 or f7. The f1 key changes multicolor 1; f7 changes multicolor 2; and f3 changes the color under the cursor. You

Sing Along With Your Favorite Christmas Carols

and Party Songs

Here's a great way for you and your family to have fun with your Commodore 64™ or Commodore 128™ this Christmas. Our exciting Christmas Carols disk features 18 of your favorite holiday songs, with professionally-arranged music and entertaining graphics. For sing along fun, the lyrics appear in easy-to-read verse on your TV or monitor. Play just your favorite song or set your computer to play them all.

SONGS INCLUDE:

- Angels We Have Heard on High • Deck the Hall
- O Come All Ye Faithful • Away in a Manger
- The First Noel • God Rest You Merry, Gentlemen
- Hark! The Herald Angels Sing • O Holy Night
- It Came Upon The Midnight Clear • Jingle Bells
- O Little Town of Bethlehem • We Three Kings of Orient Are
- Jolly Old St. Nicholas
- Joy to the World
- O Christmas Tree
- Silent Night
- What Child is This?
- Up on the Housetop

An Actual Screen

For fun on New Year's Eve and throughout the year, order our Party Songs. The disk contains 18 favorites, including Auld Lang Syne, Dixie, For He's a Jolly Good Fellow, Oh! Susanna, Yankee Doodle, and more.

You can trust John Henry Software to bring you quality software at the lowest price. We specialize in prompt delivery and guarantee our product.

Don't wait, call us today! Toll Free Number:

1-800-223-2314

in Ohio call 513-898-7660

$15.95 each

Both for only $28.95

Please send me:

_____ Christmas Carols disk(s) at $15.95 each
_____ Party Songs disk(s) at $15.95 each
_____ Christmas Carols and Party Songs at $28.95

Add $1.00 for postage and handling. Ohio residents add 6% sales tax. Foreign orders, except Canada and APO, add $3.00 for Air Mail. Please pay in U.S. funds.

☐ Check or money order enclosed ☐ Visa ☐ MasterCard

Acct. # _____ Exp. Date _____

Name _____

Address _____

City _____ State _____ Zip _____

Send to John Henry Software, P.O. Box 745, Vandalia, Ohio 45377.

John Henry Software®

QUALITY IS OUR STRENGTH

can move the cursor with the normal cursor keys, leaving a colored trail through the characters. To exit, press the left-arrow key.

```
10 REM C64 MULTICOLOR CHARACTER DEMO
20 C$="ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789
   0+-{LB.}"
30 POKE53280,0:POKE53281,0:M3=8
40 S=55296: REM COLOR MEMORY
50 POKE 53270,PEEK(53270)OR16: REM MULTICOL
   OR ON
60 POKE53282,2:POKE53283,7:FORI=STOS+999:PO
   KEI,5:NEXT: REM SET COLORS
70 FORI=0TO23:PRINTC$;:NEXT
80 GET A$
90 IFA$="{LEFT ARROW}"THENPOKE53270,PEEK(53
   270)AND239:END
100 IF A$="{FUNCT 3}"THENM3=M3+1:IFM3=16THE
    NM3=0:A$=""
110 IF A$="{FUNCT 1}"THENPOKE53282,M1:M1=M1
    +1:IFM1=16THENM1=0:A$=""
120 IF A$="{FUNCT 5}"THENPOKE53281,M0:M0=M0
    +1:IFM0=16THENM0=0:A$=""
130 IFA$="{FUNCT 7}"THENPOKE53283,M2:M2=M2+
    1:IFM2=16THENM2=0:A$=""
140 IFA$="{CRSR DN}"THENS=S+40:IFS>56295THE
    NS=S-1000:A$=""
150 IFA$="{CRSR UP}"THENS=S-40:IFS<55296THE
    NS=S+1000:A$=""
160 IFA$="{CRSR RT}"THENS=S+1:IFS>56295THEN
    S=S-1000:A$=""
170 IFA$="{CRSR LF}"THENS=S-1:IFS<55296THEN
    S=S+1000:A$=""
180 POKES,M3
190 GOTO 80
```

Extended Background Color Mode

Another aspect of the Text mode is Extended Background Color mode, which provides one additional color per cell, while retaining the same resolution as Standard mode. However, here you're limited to only 64 characters on the screen at any one time. To enter Extended Color mode, type:

```
POKE 53265,PEEK(53265)OR64
```

To exit this mode, type:

```
POKE 53265,PEEK(53265)AND191
```

The color information for each group of 64 characters is held in registers 53281–53284. A Poke to one of them will change the background color for its group.

80-Column Text

On the C-128, there is one more Text mode—80-column. In this mode, you have an 80-character by 25-line display. This is available if you have an RGB or composite monitor connected to the RGB video port by a specially designed cable.

In 80-column mode, you have full access to the Commodore character set as well as 16 colors for characters and background. It does not support sprites or Multicolor or Extended Color modes. The print commands like CHAR and Print Using work as before on the regular 40-column screen. The Color command has forms for the 80-column character, border and background colors.

On the C-128 and C-64, it's also possible to create custom character sets. By careful programming, you can replace the current set with your new definitions. It's much easier to do with a character editor, of which there are probably many in your local user's group's library.

High-Resolution Graphics

Most people find high-resolution graphics more interesting than text graphics, and it's here that the C-64 and C-128 have earned their reputations. Both have the same potential, but, due to the high level of Basic 7.0, the C-128 is far easier to use and more versatile because of its added memory.

High-resolution graphics is also called bit-mapping, because it involves turning on specific bits inside a byte. There are two bit-map modes on the computers. One is High-resolution mode, 320 × 200 dots, and the other is Multicolor (bit-map) mode, 160 × 200 dots. Here, as in Multicolor (character) mode, there's a 50 percent loss in horizontal resolution. But here, too, you gain by having four colors instead of two.

High-resolution graphics (320 × 200) allows for two colors: foreground (plotting) and background. The information about color is put into whatever 1000-byte section of memory you are using as screen, or text, memory. If you were to Poke 3 into each of the 1000 bytes of screen memory, you would have the color cyan for foreground and black for background. The formula is foreground color + (16 * background color). For red dots on a white screen, you would calculate 2 + (1 * 16). To get the desired color when you plot a dot, you would then Poke the answer, 18, into screen memory. By putting a different combination in each character cell, you can get many different combinations on the same screen.

To use high-resolution graphics on the C-64, you must perform several steps. First you must turn on Bit-map mode. Second, you must tell the computer which 8K (8000 bytes) of RAM are to be used as a bit-map screen.

There are several places available, but no standard location. The *Commodore 64 Programmer's Reference Guide* uses location 8192 as its example, which is 6K above the start of Basic. To safely use this, the start of Basic must be moved up above the screen area, which results in a loss of 14K of Basic RAM.

A better, but more complex, option is to put the screen under the Basic or Kernal ROM. The VIC-II chip *can* utilize the RAM under the ROMs, so it's not too difficult to use it as a screen for hi-res graphics, leaving your Basic program space untouched. In fact, many programs do just that.

Displaying pictures under the ROMs from Basic is not difficult, but you must use machine language to plot graphics there. That's because the Kernal ROM must be shut off while plotting your points, thereby disabling Basic. You will have to use a machine language routine for this plotting. If you put your screen in normal system RAM, a Basic algorithm can be used for plotting points, but it will be painfully slow. Here is an example of such a Basic subroutine:

```
1000 REM PASS X,Y AND BASE ADDRESS VIA GOSUB 1000
1010 CH = INT(X/8)
1020 RO = INT(Y/8)
1030 LN = YAND7
1040 BY = BASE + RO*320 + 8*CH + LN
1050 BI = 7 - (XAND7)
1060 POKE BY,PEEK(BY)OR(2↑BI)
1070 RETURN
```

To determine which video bank your screen is in, you must set a bit in the proper register (56576). Before writing to this register, you must first tell Data Port 1 that the information is coming. Next, set the bank address. Following that, set the address of the 1000-byte screen you wish to use for color memory. In the case of a bit-map screen at 8192 ($2000), the normal text screen (1024–

Simple, easy to use.

Professional quality defines new B.E.S.T. software business management systems for the Commodore 64/128.* Ease of use is unique. Manuals are illustrated, readable and easy to understand. Menus are clear and concise.

B.E.S.T. software gives you more time to focus on business. (No need for computer or accounting experience.) B.E.S.T. systems *seem* simple. Yet this is very sophisticated software, easily capable of becoming the indispensible management tool.

Our objective is to make your business easier to manage.

Available at your local computer store.

Prices: Payables & Receivables, $59.95 each; Inventory & Ledger $69.95 each; Project Planner, $89.95.

B.E.S.T. Business Electronics Software & Technology, Inc.
P.O. Box 852 / McMinnville, Oregon 97128 / (503) 472-9512

Circle 407 on Reader Service card.

*Trademark of Commodore Business Machines, Inc.

2023) can be used for color information. Finally, set bit 5 of the VIC control register (53265).

```
100 POKE 56578,PEEK(56578)OR3:REM SET TO OUTPUT
110 POKE 56576, (PEEK(56576)AND252)OR3:REM SET BANK TO 0-
    16383
120 POKE 53272,PEEK(53272)OR8:REM PUT BIT-MAP AT 8192
130 POKE 53265,PEEK(53265)OR32:REM GO TO BIT-MAP MODE
```

To enter Multicolor mode requires a little more programming. You must tell the computer to enter this mode and specify what the new colors will be. Two of the colors are stored in screen memory, as they were in High-resolution mode. A third color is stored in the background-color register (53281), and the fourth is in normal color memory (55296–56295).

```
100 POKE 53265,PEEK(53265)OR32:REM BIT-MAP MODE ON
110 POKE 53270,PEEK(53270)OR16:REM MULTICOLOR
    MODE ON
120 POKE 53272,PEEK(53272)OR8:REM PUT BIT-MAP AT 8192
130 POKE 53281,0:REM BACKGROUND COLOR BLACK
140 FOR I = 1024TO2023:POKE I,18:NEXT:REM MC1 IS WHITE,
    MC2 IS RED
150 FOR I = 55296TO56295:POKE I,6:NEXT:REM MC3 IS BLUE
```

To exit Multicolor mode:

```
200 POKE 53265,PEEK(53265)AND223:REM BIT-MAP OFF
210 POKE 53270,PEEK(53270)AND239:REM MULTICOLOR
    MODE OFF
```

That's quite a lot of work, and it's generally too difficult for most people. Its complexity and lack of speed explain why there are so many Basic extensions for the C-64. These make graphics programming much easier, but they also create confusion when it comes time to use programs or pictures made with the different extensions. A program written with Simon's Basic uses a different syntax in its graphics commands than one written with the Super Expander, making conversion difficult from one to another.

If you wish to make your Basic totally compatible on every C-64, either use Basic 2.0 or write machine language modules. Here is an example of a C-64 Basic 2.0 graphics program. It contains a plot, line and circle subroutine, which you can use to plot high-resolution graphics. However, creating hi-res graphics in Basic 2.0 is very slow.

```
1Ø REM 64 HIRES PLOT, LINE AND CIRCLE
2Ø POKE53265,PEEK(53265)OR32: REM BITMAP ON
3Ø POKE53272,PEEK(53272)OR8: REM BITMAP AT
   8192
4Ø POKE53281,2:POKE5328Ø,2:BA=8192
5Ø FORI=1Ø24TO2Ø23:POKEI,18:NEXT:REM COLORS
    RED AND WHITE
6Ø FORI=BA TO BA+7999:POKEI,Ø:NEXT:REM CLEA
   R BITMAP
7Ø X1=16Ø:Y1=25:X2=295:Y2=1ØØ:GOSUB32Ø
8Ø X1=295:Y1=1ØØ:X2=16Ø:Y2=175:GOSUB32Ø
9Ø X1=16Ø:Y1=175:X2=25:Y2=1ØØ:GOSUB32Ø
1ØØ X1=25:Y1=1ØØ:X2=16Ø:Y2=25:GOSUB32Ø
11Ø REM CIRCLE ROUTINE
12Ø CX=16Ø:CY=1ØØ:SC=1.16:FL=Ø:RD=2Ø
13Ø FOR CR=Ø TO 6.4 STEP.1
14Ø X=RD*COS(CR):Y=RD*SIN(CR)
15Ø X2=SC*X+CX:Y2=CY-Y
16Ø IFFL=1THEN18Ø
17Ø X=X2:Y=Y2:GOSUB24Ø:FL=1:X1=X2:Y1=Y2
18Ø GOSUB32Ø:X1=X2:Y1=Y2
19Ø NEXT
2ØØ GET KE$:IFKE$=""THEN2ØØ
21Ø POKE53265,PEEK(53265)AND223:POKE53272,2
    1:REM HIRES OFF
22Ø PRINT"{SHFT CLR}{CTRL 4)":REM CLEAR SCR
    EEN
23Ø END
24Ø REM PLOT ROUTINE PASS X AND Y
25Ø CH=INT(X/8)
26Ø RO=INT(Y/8)
27Ø LN=YAND7
28Ø BY=BA+RO*32Ø+8*CH+LN
29Ø BI=7-(XAND7)
3ØØ POKEBY,PEEK(BY)OR(2{UP ARROW}BI)
31Ø RETURN
32Ø REM LINE ROUTINE PASS X1,Y1 X2,Y2
33Ø X4=(X1-X2):Y4=(Y1-Y2)
34Ø IF X4=ØANDY4=ØTHENX=X1:Y=Y1:GOSUB24Ø:RE
    TURN
35Ø IF SGN(X4)=1THENZX=-1
36Ø IF SGN(Y4)=1THENZY=-1
37Ø IF SGN(Y4)=-1THENZY=1
38Ø IF SGN(X4)=-1THENZX=1
39Ø IFX4=ØTHENR=ABS(Y4):GOTO43Ø
4ØØ TA=Y4/X4
41Ø TH=ATN(TA)
42Ø R=ABS(X4/COS(TH))
43Ø Y4=ABS(Y4)
44Ø X4=ABS(X4)
45Ø X3=X4/R*ZX:Y3=Y4/R*ZY
46Ø IFR=ØTHEN51Ø
47Ø FORL=1TOR
48Ø X=X1:Y=Y1:GOSUB24Ø:REM PLOT X AND Y
49Ø X1=X1+X3:Y1=Y1+Y3
5ØØ NEXT
51Ø RETURN
```

C-128 Hi-Res Graphics Commands

On the C-128, however, all of this can be done easily, quickly and in a standard manner, due to its built-in graphics commands, which will be the same from one program to another. In fact, the C-128's Basic 7.0 is capable of handling all the high-resolution graphics the VIC chip supports.

For example, to go to High-resolution (320 × 200) mode on the C-128, simply type:

```
GRAPHIC 1,1
```

The first 1 indicates High-resolution mode, and the second 1 means clear the screen. When this order is given, the screen immediately goes to Bit-map mode and clears the 8K of RAM, giving you a clean work area. If you had typed

```
GRAPHIC 2,1
```

the screen would have gone to High-resolution mode and cleared, but this time not all of the screen would be bit-map. The bottom five lines would be in Text mode, giving you a Split-screen mode, similar to the Split-screen mode on the Apple computer. Unlike the Apple, you can vary the location of the split screen by adding a third optional parameter:

```
GRAPHIC 2,1,12
```

The 12 indicates the split should be at row 12, making everything above it bit-map and everything below it text. You can vary where the split occurs, from 0 to 24.

Multicolor mode is just as easy to use. If the first parameter in the Graphic command is 3 or 4, the screen goes to multicolor Bit-map mode. Again, the optional third parameter can be used to set the split screen's location, if you want one.

You notice I didn't say anything about where in memory the bit-map screen is. The C-128 has a standard location for bit-map RAM (8192) and for color memories. No registers need to be set; the system takes care of it all.

Circle 433 on Reader Service card.

Who needs this?

When you can solve disk drive alignment problems in 60 minutes with the CSM program.

Disk drive alignment problems?
Drive out of alignment again?
Tired of waiting two weeks or more to get your drive fixed??

WE HAVE THE ANSWER ! !

With the 1541 DISK DRIVE ALIGNMENT PROGRAM you can align the drive yourself in an hour or so. Not only that, you can do it at home AND no special equipment is required. Anyone with average mechanical skills can do it!!

Read What Compute!'s Gazette had to say. (Oct., 1984)

"... with 1541 Disk Drive Alignment *from CSM Software, you can fix it* [the disk drive] *yourself in an hour or so and the program will pay for itself the first time you use it...No technical expertise is required to accomplish the alignment procedures, and the manual accompanying the program thoroughly describes the procedures."*

1541 DISK DRIVE ALIGNMENT PROGRAM - VERSION 2.0 - *$44.95 plus shipping*

CARTRIDGE BACKER V2.0

IMPROVED AND UPDATED!!

The best cartridge - to disk backup system is now even better. The software has been enhanced to back up many more cartridges and disk programs. Cartridges will run from the disk as-is and do not require any ROM or RAM expansion boards. VERSION 2.0 software update is available to ALL prior purchasers of CARTRIDGE BACKER and CARTRIDGE CRACKER (from BEAR).

Complete system
(includes software and expansion board) —

$54.95 plus shipping

Software update only (call for details) —

$14.00 plus shipping

PROGRAM PROTECTION MANUAL FOR THE C-64 VOLUME II

Not just a third edition — a new and up-to-date manual covering the latest advances in program protection. Over 275 pages of valuable information. Topics include:

- *ENCRYPTION AND DECRYPTION*
- *UNDOCUMENTED OPCODES*
- *GCR RECORDING*
- *CUSTOM DOS ROUTINES*
- *CARTRIDGES AND EPROMS*
- *PROTECTING YOUR OWN SOFTWARE*
- *TIPS FROM EXPERTS ON PROTECTION, BACKUP & MORE*
- *DISK INCLUDED*

$34.95 plus shipping

★ ★ **NEW PRODUCT** ★ ★

EPROM PROGRAMMERS HANDBOOK

Finally, a reference book written for the average user. Until now EPROM programming was simply too difficult for most people. The EPROM PROGRAMMERS HANDBOOK will take the mystery out of putting your favorite programs on cartridge. Learn to create your own cartridges and customize your computer and disk drive. Discover the power of programming your own EPROMs.

- *Covers beginning thru advanced topics.*
- *Simplifies EPROM programming so that anyone can do it.*
- *Perfect companion for the PROMENADE and other EPROM programmers.*
- *Create your own auto-start cartridges, custom KERNAL, modified DOS and specialized EPROMs.*
- *Put many programs on a single cartridge with MENU-MAKER.*
- *Disk includes ready-to-use routines and helpful utilities.*

$32.95 plus shipping

PROGRAM PROTECTION MANUAL FOR THE C-64 VOLUME I

- *A MUST FOR BEGINNERS*
- *THE PERFECT INTRODUCTION TO PROGRAM PROTECTION*
- *DISK INCLUDED*

$29.95 plus shipping

VISA AND MASTERCARD ACCEPTED
Shipping $3.50 per item in U.S.; foreign orders extra

SNAPSHOT 64

SNAPSHOT 64 is a unique and exciting utility that virtually takes a picture of your computer's memory. SNAPSHOT 64 then saves that 'snapshot' to disk and automatically creates an auto-boot loader for the program. Once saved to disk the program may be restarted at the exact same point at which it was interrupted!!!

SNAPSHOT 64 is the perfect answer for those looking for the ultimate backup utility. Think of it, being able to stop most any program after the protection check and then being able to resume the program at the same point, totally bypassing the protection check.

- **MOST EFFECTIVE UTILITY OF ITS KIND** - *EVEN MORE EFFECTIVE THAN THOSE UTILITIES THAT CLAIM TO "COPY ALL MEMORY-RESIDENT SOFTWARE"*
- *INVISIBLE TO SOFTWARE — CANNOT BE DETECTED*
- *SNAPSHOT FILES RUN BY THEMSELVES — THE BACKUP COPY WILL RUN AS-IS, WITHOUT THE SNAPSHOT CARTRIDGE*
- *WORKS MUCH FASTER THAN OTHER SIMILAR UTILITIES*
- *EASY TO USE — NO COMPLICATED INSTRUCTIONS — EVEN A CHILD CAN DO IT*
- *SNAPSHOT FILES ARE COMPATIBLE WITH FAST LOAD UTILITIES*
- *SNAPSHOT FILES WILL LOAD FROM ALL COMMODORE COMPATIBLE DISK DRIVES*
- *STORE MANY DIFFERENT SNAPSHOTed FILES ON A SINGLE DISK*
- *FULLY SELF-CONTAINED ON CARTRIDGE — NO DISK TO HASSLE WITH*
- **EXCLUSIVE FEATURE:** *THE CODE INSPECTOR — ALLOWS MOST PROGRAMS TO BE STOPPED, EXAMINED, MODIFIED AND RESUMED WHILE STILL IN MEMORY!!*
- *NO PARAMETERS NEEDED — AS OFTEN REQUIRED BY OTHER UTILITIES*
- *COMPLETE AND THOROUGH MANUAL IS INCLUDED*
- *SOLD FOR ARCHIVAL PURPOSES ONLY*
- *RAVE REVIEWS IN:* INFO 64, MIDNIGHT GAZETTE & PROGRAM PROTECTION NEWSLETTER

SNAPSHOT 64™

$49.95 + $3.50 SHIPPING

C= is a registered trademark of Commodore Business Machines, Inc.

Available through your local software dealer or call:

CSM SOFTWARE, INC.

POST OFFICE BOX 563, CROWN POINT IN. 46307, PHONE (219) 663-4335

The Graphic command is very useful, as it will switch you easily between the C-128's six graphics modes. To use, simply type GRAPHIC, followed by one of the six parameters (0–5), and the job is done.

Mode	Description
0	40-column text
1	Standard bit-map graphics
2	Standard bit-map (split screen)
3	Multicolor bit-map graphics
4	Multicolor bit-map graphics (split screen)
5	80-column text

The C-128 has many other useful high-resolution graphics commands. As mentioned earlier, there is the CHAR command, which allows you to put text characters and other symbols on the bit-map screen.

The Draw command is a general-purpose line routine you can use for drawing a point, line or several lines. Its syntax is:

DRAW <color source>,X1,Y1 <TO X2,Y2> <TO X3,Y3>...

One of the nice features of the C-128 is the use of optional parameters, or parameters with default values. The color source is one such parameter. If omitted, color source 1 (foreground color) is the default value, and, therefore, the one that is used. If color source is 0, then background color is used. A 2 or 3 could be used in Multicolor mode to access those extra colors. If you are just plotting a dot, only the first X and Y are required. Include X2 and Y2 to create a line, and X3 and Y3 to connect a second line, and so on.

Colors can be selected with the Color command:

COLOR source number, color number

Color	Source
0	40-column background
1	40-column foreground
2	Multicolor 1
3	Multicolor 2
4	40-column border
5	Text character color
6	80-column background color

You can change drawing colors in mid-program without affecting those already on the screen (unless you replot within the character cell area with a new color).

The Circle command gives you an easy way to make circles, of course, but it can also be used for ellipses, arcs and rotated versions of each. Its syntax is:

CIRCLE<color source>,X,Y<,Xr><,Yr><,sa><,ea><,angle><,inc>

Color source can be any of the four sources previously mentioned, and X and Y are the screen coordinates of the center of the circle. Xr is the X radius and Yr is the Y radius. Varying them gives different types of ellipses. Sa is the starting arc in degrees (0–360), and ea is the ending arc. Angle is the overall rotation to be applied to the figure, and inc is the number of degrees between segments. By changing the inc, you can draw polygons instead of circles.

Here is an example program of circles on the C-128, demonstrating many features of its flexibility:

```
10 REM CIRCLE COMMAND DEMO
20 COLOR0,1:COLOR4,1:COLOR1,6
30 GRAPHIC1,1
40 COLOR1,2
50 CHAR1,0,9,"CIRCLE"
60 CIRCLE1,22,100,15,13 : REM CIRCLE
70 COLOR1,3
80 CHAR1,0,24,"ELLIPSE"
90 CIRCLE1,70,100,8,99 : REM ELLIPSE
100 COLOR1,4
110 CHAR1,12,3,"OCTAGON"
120 CIRCLE1,124,52,20,18,,,,45: REM OCT
130 COLOR1,6
140 CHAR1,13,22,"DIAMOND"
150 CIRCLE1,131,148,20,,,,,90: REM DIAM
160 COLOR1,7
170 CHAR1,19,10,"TRIANGLE"
180 CIRCLE1,184,108,20,18,,,,120:REM TRI
190 COLOR1,8
200 CHAR1,24,20,"ARC"
210 CIRCLE1,90,100,150,99,55,125:REM ARC
220 COLOR1,9
230 CHAR1,31,3,"ARC WITH"
240 CHAR1,33,10,"LINE"
250 CIRCLE1,275,58,20,16,90,360:REM STC
260 DRAW1,275,42 TO 275,58 TO 295,58
270 CIRCLE1,280,54,20,16,0,90:REM STC
280 DRAW1,280,38 TO 280,54 TO 300,54
290 COLOR1,13
300 CHAR1,32,22,"ROTATED"
310 CHAR1,32,23,"ELLIPSE"
320 FORI=0TO180STEP20:CIRCLE1,280,152,5,20,,,
    I:NEXT
330 GETKEY A$
340 GRAPHIC0
350 END
```

Another special drawing command is Box, which allows you to draw a rectangle of any size, rotate it and fill it with color.

BOX<color source>,X1,Y1<,X2,Y2><,angle><,paint>

X1 and Y1 are the coordinates of the top-left corner; X2 and Y2 are those of the bottom-right corner. If X2 and Y2 are omitted, the current pixel cursor is used. The angle is the number of degrees of rotation you wish (default is 0), and the paint (0 or 1) indicates whether or not you want the box painted.

The Box command used with the angle parameter can be very effective and certainly unbox-like!

```
1Ø REM BOX DEMO
2Ø COLOR1,3:COLORØ,1:COLOR4,1:GRAPHIC1,1
3Ø CHAR1,14,1,"STANDARD BOX"
4Ø BOX1,45,22,265,188
5Ø SLEEP3
6Ø COLOR1,7
7Ø CHAR1,14,22,"ROTATED BOXES"
8Ø FORI=ØTO36ØSTEP1Ø:BOX1,9Ø,72,22Ø,128,I:N
   EXT
9Ø GETKEY A$
1ØØ GRAPHICØ
11Ø END
```

The Paint command fills an area with the color you specify.

PAINT<color source>,X,Y<,mode>

X and Y indicate to the program the locations at which to start painting. The mode parameter indicates the kind of paint you wish. A mode of 0 paints an area defined by the color source. A mode of 1 paints an area defined by any non-background source.

The Scale command changes the scaling used for the bit-map graphics commands. You may increase the default values (320 × 200 in High-resolution mode and 160 × 200 in Multicolor mode) up to a maximum of 32767. This does not give you any extra resolution, but can be very useful in work that requires detailed calculation of graphics data.

SCALE n<,xmax,ymax>

The n signifies off or on (0 or 1); xmax and ymax set

the new upper values for the bit-map scale you want to use.

The SCNCLR command allows you to selectively clear your text, bit-map or multicolor screen without using the Graphic command.

One of the C-128's most unusual and potentially useful graphics commands is SSHAPE, which lets you save areas of the bit-map screen as string variables. You can then restore them to the graphics screen with the GSHAPE command or store them as sprites with the SPRSAV command, giving very powerful graphics capabilities.

SSHAPE string variable,X1,Y1<,X2,Y2>

The string can be any string variable, such as A$ or B$(159,6). X1 and Y1 are the upper-left-corner coordinates, while X2,Y2 are the opposite, lower-right-corner coordinates of the rectangle you want to save. A maximum of 255 bytes can be stored in a string, so the size of the rectangle is somewhat limited. Color information is also saved with the bit-map.

The GSHAPE command will write the rectangle back to the screen at the specified locations. Before doing so, it can perform a number of operations on it, such as inversion, reverse, ANDing and XOR.

GSHAPE string variable<X,Y><,mode>

The X and Y can be omitted, and the pixel cursor will be used for their values. The mode allows for reversing and altering the rectangle area before writing it. Here is a short program that demonstrates the SSHAPE and GSHAPE commands.

```
10 REM SSHAPE/GSHAPE DEMO
20 COLOR0,1:COLOR4,1:COLOR1,6
30 GRAPHIC1,1:C=1
40 COLOR1,13
50 CHAR1,32,23,"ROTATED"
60 CHAR1,32,24,"ELLIPSE"
70 FORI=0TO180STEP30:CIRCLE1,15,15,4,15,,,I
   :NEXT
80 SSHAPE C$,0,0,30,30
90 SCNCLR1
100 FORY=6TO183STEP37
110 FORX=15TO299STEP49
120 C=C+1:IFC>16THENC=2
121 COLOR1,C
130 GSHAPE C$,X,Y
140 NEXT:NEXT
150 GETKEY A$
160 GRAPHIC0
```

Other useful C-128 commands include BLOAD and BSAVE, for restoring and saving a screen to and from disk. In fact, the C-128 Basic 7.0 fully supports all aspects of the high-resolution graphics that the VIC-II can perform.

There is one more type of bit-mapping possible on the C-128—using the 80-column (640 × 200) screen. Commodore claims 80-column graphics are possible, but Basic 7.0 doesn't have any keywords to support this. As with the C-64, you will need special routines to use this mode. Once you access 80-column mode, however, you are at an advantage in that you can utilize the Fast command without having the screen become blank.

Another very important command on the C-128 is the sprite command, SPRSAV, which can either store into a string variable the contents of one of the sprite storage areas or store into the sprite storage area the data from a string. If that string was created with the SSHAPE command, you can then very easily pick up and animate sections of the bit-map as sprites! This opens new areas of graphics applications on the C-128.

Sprites

It isn't possible to discuss graphics on the C-64 and C-128 without spending some time talking about sprites, or movable object blocks. Both computers have this powerful feature, and both are capable of impressive animation. The C-128 uses keywords to let you create and manipulate sprite graphics in its Basic 7.0, while C-64 owners must use Peek and Poke statements to do this.

Programming sprites with the Peek and Poke statements isn't as difficult as programming bit-map graphics with them. In some respects, if you're talking about internal animation, not external motion, sprite animation can be fast enough from Basic using Peek and Poke statements.

Internal animation involves changing the pointers that define where in memory the sprite image resides. With a simple Poke, or sequence of Pokes, that image can appear to give way to a highly animated figure, such as a bird flapping its wings. Each frame of the animation is contained in memory in a separate sprite definition. By Poking the correct values into the sprite-pointer register, the image changes in sequence. In most cases, this is done only a couple of times a second, a speed easily handled by Basic.

External movement is a different matter. Here, you need machine language routines or Basic enhancements to give the fast, smooth motion most sprite programmers require. On the C-128, these commands are a standard feature, giving the programmer full access to sprites with a minimal effort. On the C-64, you must be a little more knowledgeable about the machine.

There are two types of sprites—standard and multicolor. Multicolor gives only half the horizontal resolution, while adding more colors. Normal high-resolution sprites are 24 pixels wide by 21 pixels long. They can each have one color, which can differ for each of the eight sprites. Multicolor sprites are 12 pixels wide by 22 pixels long and can have three colors per sprite. You may have eight tri-colored sprites on screen at a time, but each sprite must share two of the same colors. Also, on both the C-64 and the C-128, you may combine the sprite modes, simultaneously displaying some multicolor sprites and some standard ones.

Let's first talk about sprite programming on the C-64. While the information is applicable to the C-128, it isn't necessary, since you'll almost always use the C-128 sprite commands.

Fourteen registers, or memory locations, allow sprites to be defined, located, moved, animated and enabled. Most of the locations are in the VIC-II chip, and can be used by Poking the proper value in memory. The sprite-pointer registers are not located in the VIC-II area, but in the last eight bytes of screen memory in the video bank you are using. When the computer is switched on, they are at 2040–2047.

Let's go through creating and animating a sprite on the C-64; then we'll compare it to what is required on the C-128.

First, you must design the sprite. The *Commodore 64 Programmer's Reference Guide* and the user's manual provide examples on how to draw and calculate a sprite on paper. Do it this way once, to see what it entails; then get yourself a decent sprite editor, many of which are available from your local user's group; they will make sprite design much,

much easier. Once you have your sprite in the form of Data statements (usually done by the sprite editor), you can begin programming your sprite.

To begin, you must define the sprite's characteristics, such as color, mode, expansion and priorities. We'll work with sprite 0, the first sprite.

```
10 REM C64 SPRITE DEMO
20 V=53248: REM START OF VIC REGISTERS
30 POKEV+39,2:REM SPRITE 0 COLOR REGISTER (
   2=RED)
40 POKEV+23,0:REM NO Y EXPANSION
50 POKEV+29,0:REM NO X EXPANSION
60 REM SPRITE CHARACTERISTICS DEFINED
70 REM READ SPRITE DATA
80 FORI=0TO62:READQ:POKE832+I,Q:NEXT
90 REM SET SPRITE POINTER
100 POKE2040,13:REM SPRITE POINTER VALUE =
    832/64=13
110 POKEV+0,0:REM POSITION SPRITE 0 AT X=0
120 POKE V+1,120:REM POSITION SPRITE 0 AT Y
    =120
130 POKE V+16,PEEK(V+16)AND(255-1):REM TURN
     OFF MSB
140 REM TURN ON SPRITE
150 POKEV+21,PEEK(V+21)OR1
160 REM MOVE SPRITE ACROSS SCREEN
170 FOR I = 0 TO 335
180 IF I>255THENPOKEV+16,PEEK(V+16)OR1:X=I-
    255
190 IF I<256THENPOKEV+16,PEEK(V+16)AND(255-
    1):X=I
200 POKEV+0,X
210 NEXTI
220 POKEV+21,PEEK(V+21)AND(255-1):REM SPRIT
    E OFF
230 POKEV+0,0:REM POSITION SPRITE
240 POKEV+16,PEEK(V+16)AND(255-1):REM TURN
    OFF MSB
250 GOTO140: REM LOOP AGAIN
260 REM SPRITE DATA
270 DATA 0,127,0,1,255,192,3,255,224,3,231,
    224
280 DATA 7,217,240,7,223,240,7,217,240,3,23
    1,224
290 DATA 3,255,224,3,255,224,2,255,160,1,12
    7,64
300 DATA 1,62,64,0,156,128,0,156,128,0,73,0
    ,0,73,0
310 DATA 0,62,0,0,62,0,0,62,0,0,28,0
```

On the C-64, all of this is required to define one multicolor sprite, position it, turn it on and move it horizontally on the screen. While the code may seem complex, it does get easier with practice. After a while, you find that it's not all that hard; it's just that external animation is slow. By successively changing the pointer register, you can achieve internal animation that is very fast (fine for frame-by-frame animation). However, for fast sprite motion, you must rely on machine code or Basic enhancements.

The equivalent code on the C-128 is:

```
10 REM C128 SPRITE DEMO
20 FOR I=0TO62:READS:POKE3584+I,S:NEXT: REM
    LOAD SPRITE DATA
30 MOVSPR1,0,120: REM POSITION SPRITE
40 SPRITE 1,1,8,0,0,0,0:REM DEFINE AND TURN
    ON
50 MOVSPR 1,90#15:REM AUTO ANIMATE SPRITE
60 GETKEY A$
70 MOVSPR1,90#0:REM TURN OFF ANIMATION
80 SPRITE 1,0: REM TURN SPRITE OFF
90 END
100 REM SPRITE DATA
110 DATA 0,127,0,1,255,192,3,255,224,3,231,
    224
120 DATA 7,217,240,7,223,240,7,217,240,3,23
    1,224
130 DATA 3,255,224,3,255,224,2,255,160,1,12
    7,64
140 DATA 1,62,64,0,156,128,0,156,128,0,73,0
    ,0,73,0
150 DATA 0,62,0,0,62,0,0,62,0,0,28,0
```

As you can see, the same feat was accomplished much more easily and required far less program code. This is a good demonstration of the amount of work you save by using a high-level language instead of a low-level language (and Basic 2.0 is a low-level language as far as graphics are concerned). Add the fact that a sprite editor is resident in the C-128, and you can see why sprite programming on the C-128 is so much faster and easier than on the C-64. With the proper enhancements, though, much the same can be done on the 64.

As you can see, the graphics modes on the C-64 and C-128 are very similar, and the C-64 has most of the same capabilities as the C-128. The differences lie in the programmer's ease of access when using Basic 7.0 and in the additional memory of the C-128. This additional space lets you store many graphics screens, while still retaining hundreds of sprites as variables in memory.

In spite of the programming differences, both the C-64 and C-128 have the VIC-II chip, and both can produce exceptional graphics. R

Address all author correspondence to Louis Wallace, 6124B SW 11th Place, Gainesville, FL 32607.

Circle 449 on Reader Service card

Use your **Commodore 64** to improve your performance at the track! These fine programs for **Thoroughbreds, Harness Horses** and **Greyhounds** combine the power of your computer with the savvy of a veteran handicapper. Spend a few minutes entering data, and The Handicapper will rank the horses or dogs in each race. All the information you need is readily available from the Thoroughbred Racing Form, harness or greyhound track program. We even provide a diagram that shows you where to find it!

Horse racing factors include speed, class, past performance, post position, stretch gain, beaten favorite, jockey or driver's record, weight (for thoroughbreds) and parked-out signs (for trotters). **Greyhound factors** include speed, past performance, class, favorite box, kennel record, breaking tendencies, beaten favorite.

Instructions and wagering guide included. **Thoroughbred, Harness or Greyhound Handicapper,** only $34.95 each on tape or disk. Any two, just $54.95. All three only $74.95.

MasterCard **Federal Hill Software** VISA®
8134 Scotts Level Rd.
Baltimore, MD 21208

Toll Free (Orders Only) 800-245-6228
For Information Call 301-521-4886

GREAT SOFTWARE FOR UNDER $8?

No manual required.

That's why we named it LOAD 'N' GO!™ Software. All documentation is right on the disk, in easy to understand, straightforward English. So you don't need to study for six weeks before using one of our spreadsheets.

Fun to use.

And LOAD 'N' GO! Software is fun to use. Our game programs are bright, colorful, action-filled, and just plain exciting. And our productivity software is application-oriented, so you can use them — productively — the first time you boot them up.

Great graphics.

It's affordable.

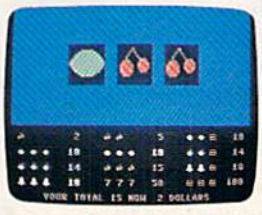
Best of all, LOAD 'N' GO! Software is affordable. Our programs cost less than $8.00. That means you can afford to develop your own program library. And many of our disks carry two and often *three* programs. You just won't find a better deal than LOAD 'N' GO! Software for the Commodore® and Apple® computers.

Games.

Looking for a great adventure story? Try "Adventure Master." Gambling games? You'll love "Championship Gambler." In fact, you'll love our entire line of arcade-style games.

Productivity.

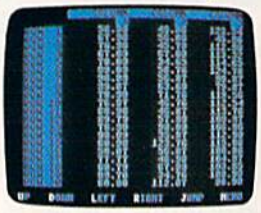
And where else can you find a really good word processor, spread sheet or data base for under $8? Only LOAD 'N' GO! Software has such a huge selection of productivity software that's *so* affordable and simple to learn. No manuals. No lifetime learning commitment. Just great software at a super price.



Super action.

Education.

And for the educator in the family, you now have a source for the high quality educational software you've been looking for. Math, spelling, vocabulary, skills development — all of it well designed and fun to use.



No manuals required.

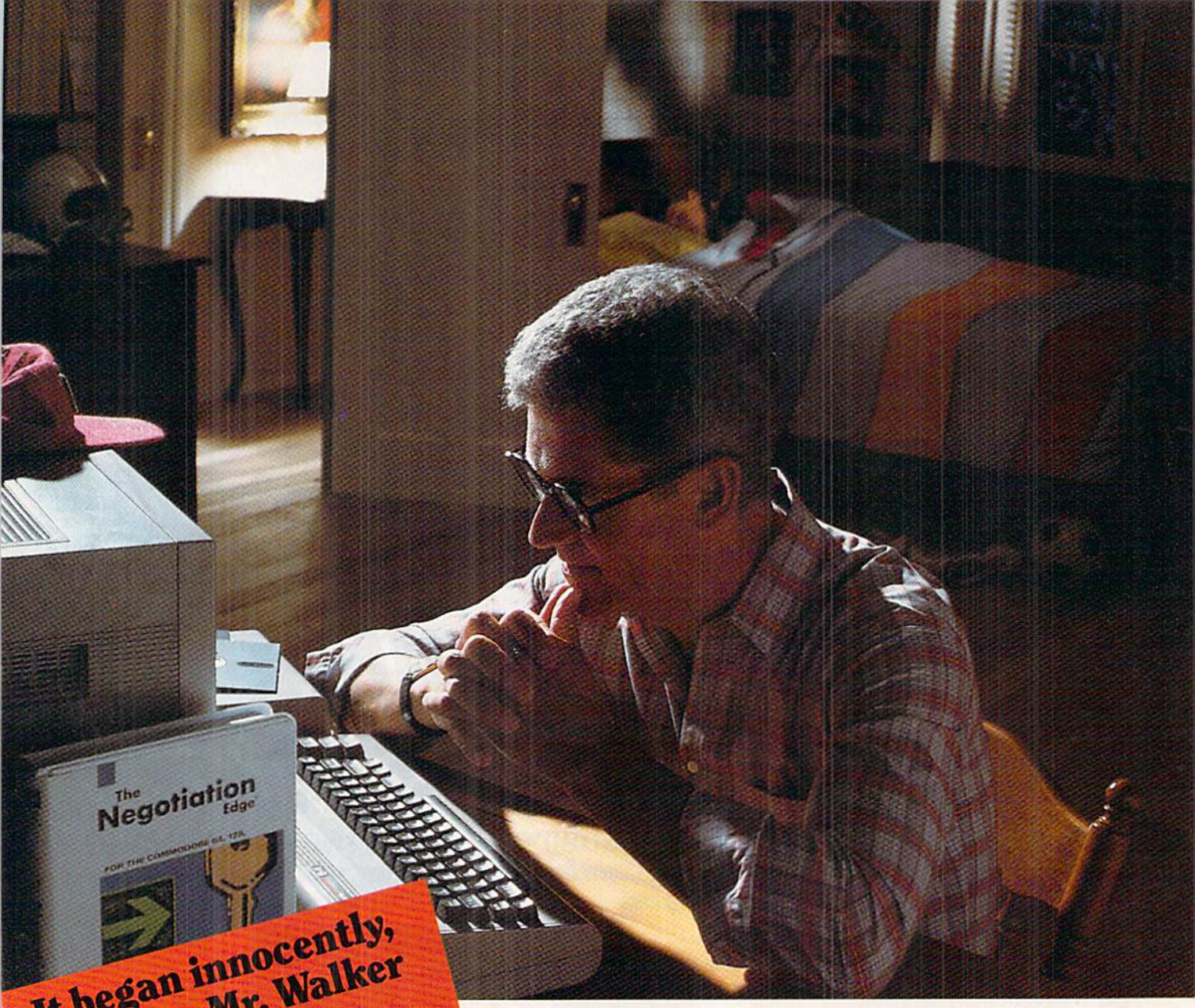
So when you're looking for *quality* software for your Commodore 64 or 128, *or* Apple II+, IIc or IIe, look for LOAD 'N' GO! Software. It's great software at a super price. You'll find LOAD 'N' GO! Software at your nearest software retailer.

For your copy of our complete software brochure, circle the reader service card.

LOAD'N'GO!™ SOFTWARE

A product of ShareData, Inc.
Minneapolis, MN 55344

Copyright © 1985 Green Valley Publishing division of ShareData, Inc. All rights reserved.
Apple is a registered trademark of Apple Computers, Inc.
Commodore is a registered trademark of Commodore Business Machines, Inc.



It began innocently, but soon Mr. Walker was running his entire career on little Bobby's Commodore.

Mr. Walker had never used a computer when he read about Info Designs' Negotiation Edge.™ He'd been meaning to ask for a raise and was looking for an "Edge."

That night, as Bobby slept, Mr. Walker's career turned. "Hey, Info Designs software makes Commodore® a terrific business computer."

The Edge line is people-insight software that's easy-to-use and only costs $79.95.*

He got the raise and bought the rest of the Edge line: The Sales Edge,™ Management Edge,™ and Communication Edge.™ His new love affair with Info Designs software was paying off.

Bobby's room became Mr. Walker's office away from the office. He bought Info Designs' WordPro III Plus™ package for $49.95 when he began issuing memos. And the complete Integrated Software Series for accounting: General Ledger, Payables, Receivables, Inventory, and Payroll for $49.95* each when he became a partner.

The ISS accounting modules are powerful, easy-to-use, and easy-to-learn. They include every business feature.

Mr. Walker was ecstatic with his new computerized business. And Bobby was happy because the monsters stayed in the closet while dad was in the room.

Don't let your Commodore and career sit on the shelf, Info Designs business software can help you get ahead. Buy it at your local software retailer. It makes good business sense.

*U.S. Currency. Accounting series marketed in different packaging for Canada.

InfoDesigns®

Circle 403 on Reader Service card.

Find the entire line of Info Designs business software at a dealer near you.

The 10 power-packed products of Info Designs business software line:

The Sales Edge™

Provides individually tailored strategy reports to improve customer relationships.

After the sales executive has completed the self-assessment and the customer-assessment, a sales strategy report is generated instructing the salesman in aspects of business style and personality most likely to strike responsive chords with the style of a given client.

The Negotiation Edge™

Designed to help the user prepare, develop, and successfully complete any negotiation or bargain.

On the basis of information provided by the user about himself and a specific counterpart, the program produces a detailed negotiation plan. The plan includes a step-by-step blueprint for winning negotiations in a variety of personal and business situations.

The Management Edge™

Advises the manager how to get results by increasing productivity, successfully motivating subordinates, and resolving on-the-job-conflicts.

After the manager agrees or disagrees with a series of statements, the machine assimilates information from a bank of proven management tactics and selects those most appropriate to the specified subordinate. Suggestions are printed in a detailed management strategy report on how to work with the individual and get the desired results.

The Communication Edge™

Prepares you to work more effectively in meetings and conversations. It enables you to emphasize your communication strengths and avoid the potential pitfalls built into any conversation.

The program presents a series of simple questions to assess your communication style and the styles of counterparts. A strategy report is generated detailing ideas for a better relationship and ways to communicate more effectively.

General Ledger

Get a customized chart of accounts and comprehensive management report, including financial statements and trial balances. This integrated program maintains present months, quarter- and year-to-date, plus previous quarter and year balances. (Interfaces with Receivables, Payables, and Payroll.)

Receivables

Makes it simple to maintain complete customer master files, including year-to-date activity, credit limit, authorization, and current balance. Provides reports on aged open receivables, invoices, statements, and customer activity lists. (Interfaces with General Ledger for automated posting.)

Payables

Build a master vendor file, including year-to-date purchases, current balance, and recurring vendor invoice information. Provides automatic aging of open items, check with full remittance information and check register. (Interfaces with General Ledger for automated posting.)

Inventory

Perpetual inventory records for all items include stock numbers, average cost, three retail prices, reservations, economic order quantity and re-order levels. Processes stock receipts, issues, orders and adjustments with full audit trails. Provides key management reports, including stock status, shortage and recommended re-order reports.

Payroll

A master record for each employee includes current period, quarter- and year-to-date pay activity. Automatically calculates period pay amounts, including miscellaneous pay and deductions, federal, state, and local taxes and FICA. Provides comprehensive reports, including W2s, 941s, payroll checks with full pay/deductions detail and payroll journals. (Interfaces with General Ledger for automated postings.)

WordPro III Plus™

An easy-to-use, full-functioned word processor with an installed base of 50,000 units. It includes built-in mail merging for form letters and global search & replace. It provides automatic page numbering, headers, footers, and automatically totals columns.

Buy the Info Designs line at one of these dealers:

UNITED STATES

Software City, all locations

Arizona
Austin Telephone & Computers, Phoenix

California
Computer 64 Store, Bell Flower
Computer Outlet, San Diego
HT Electronics, Sunnyvale

Connecticut
SoftTown, Danbury
20th Century Television, Hartford

Delaware
Software Kingdom, Dover

Florida
AA Computers, Jacksonville

Illinois
A Software Store, Oaklawn

New Hampshire
Micon Computer, Londonderry
SoftSpot, Manchester

New Jersey
Software City, Cherry Hill

New York
Boscov's Dept. Stores, all stores
CIA Software, Bayside
Computer Plus, Deer Park
Computer Plus, Hewlett
Computer Plus, Lake Grove
Computer Plus, Patchoque
Computerware, East Meadow
Micro Hutt, Bayshore
Micro Electronics, Valley Stream

Pennsylvania
Boscov's Dept. Stores, all stores
Whitehouse Computers, Williamsport
Some Hole In The Wall, Philadelphia

Texas
Babbages, Houston
Babbages, Dallas/Fort Worth
Federated/Videoland, all stores
The Computer Experience, San Antonio

Virginia
Virginia Micro Systems, Woodbridge

CANADA

Alberta
Compute or Play, Edmonton
Computerworks, Edmonton
Red Deer Microsystems, Red Deer
Selectdisk, Edmonton
Soft Options, Calgary
Wise Software Solutions, Calgary
Hindson Computing, Calgary
Hindson Computing, Lethbridge

British Columbia
Admiral Electronics, Surrey
Computer King, Prince George
Conti Computer System, Vancouver
Let's Compute Services, Kelowna
Nu-Tec Computers & Electronics, Vancouver
Owen & Sons, Victoria
Softstuff, Burnaby
Super Software Inc, Richmond
The Computer Shop, Williams Lake

Manitoba
Canadian Computer ERA, Brandon
Micromart Inc, Winnipeg

Newfoundland
J.W. Allan Ltd, St. John's

Nova Scotia
Kobetek Systems Ltd, New Minas

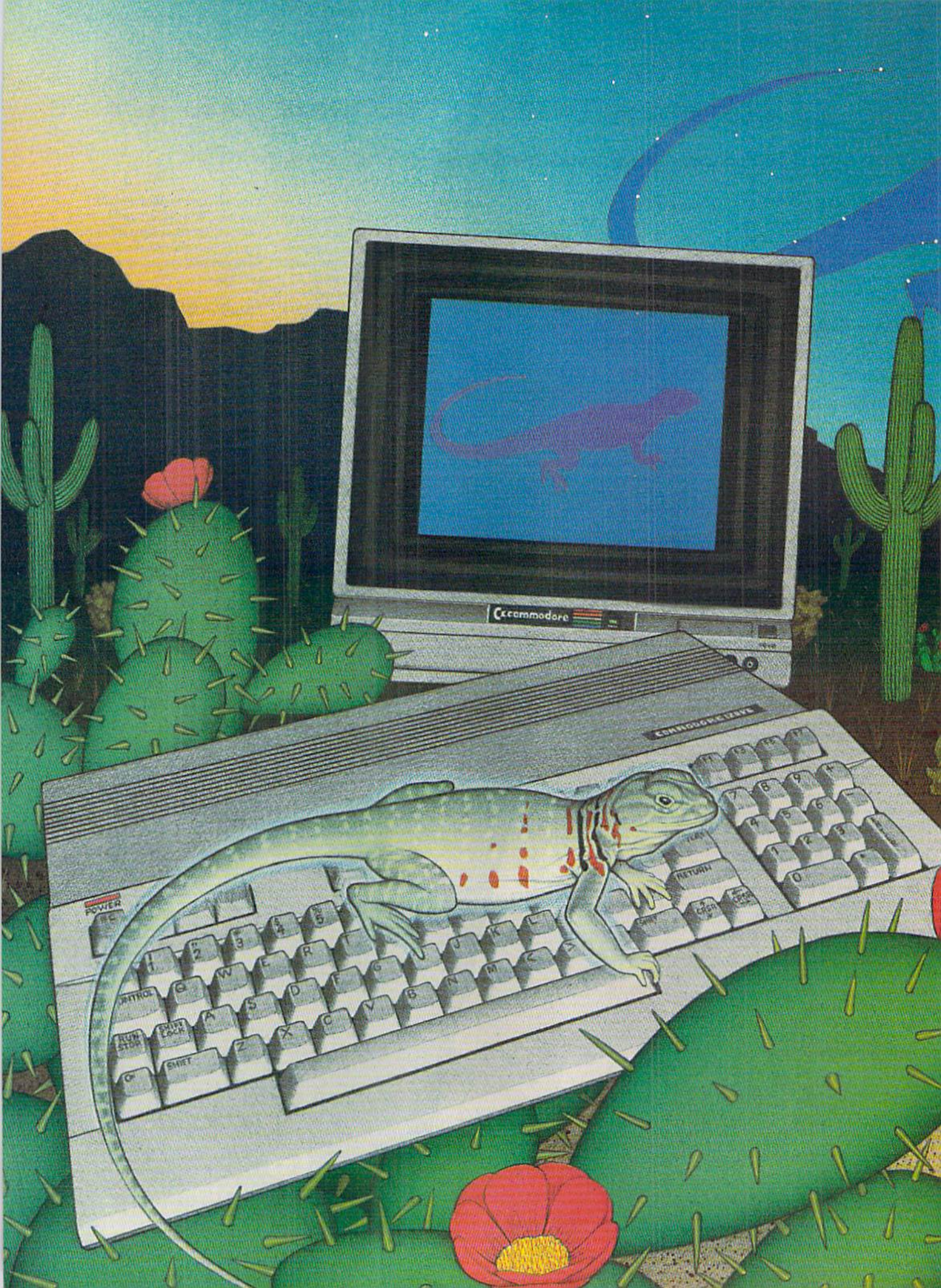
Ontario
Canadian Software Source, Toronto
Computer Country, Stratford
Comspec, Downsview
Con-pute, Oshawa
G. Plus, Ottawa
Games Plus, Midland
Mr. Diskette, Ottawa
Software Capitol, Ottawa

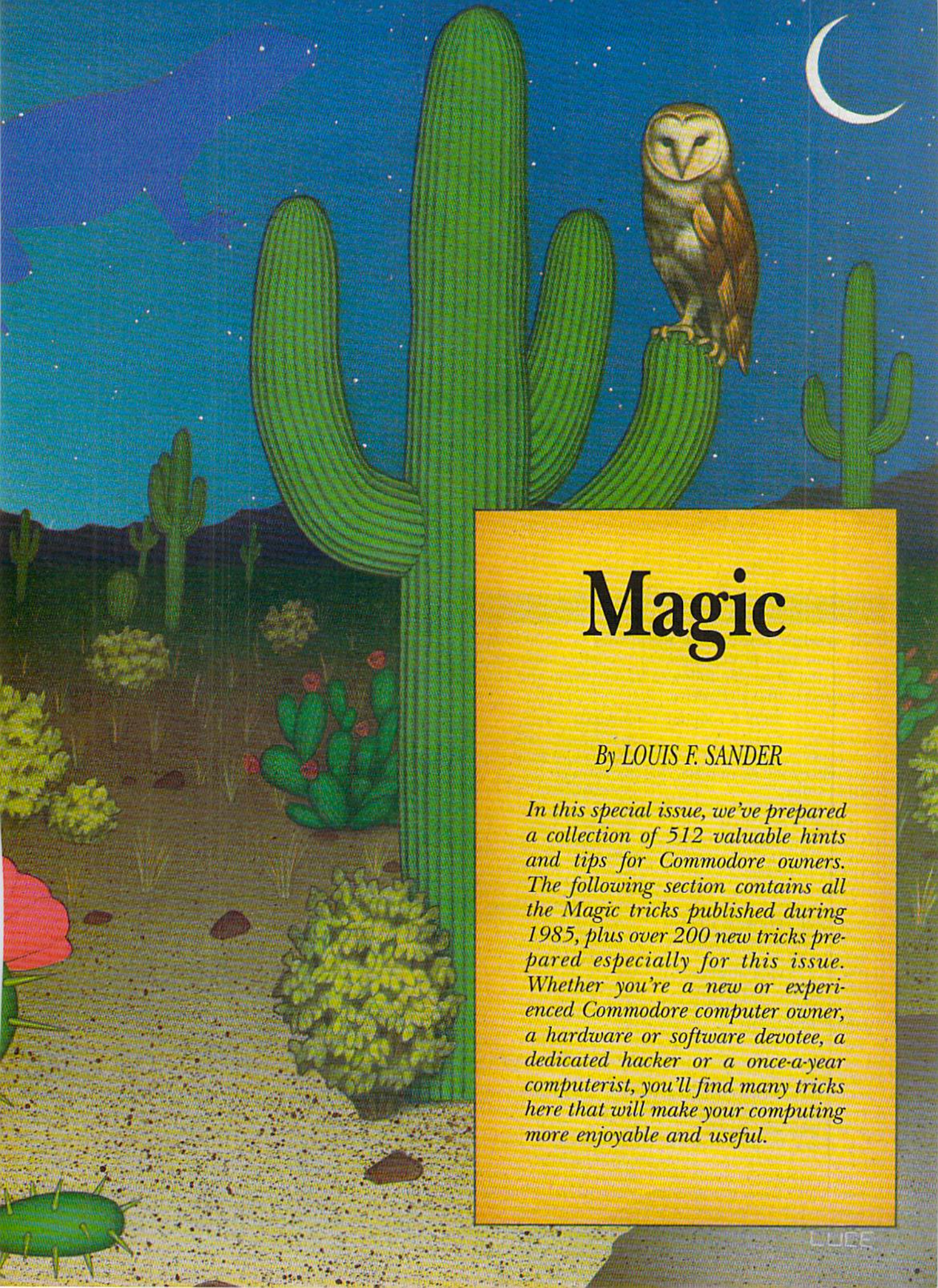
Quebec
Soft Wares Co., Montreal

Saskatchewan
Memory Lane Computers, Saskatoon
Software Supermarket, Regina
Zycon Computing Ltd, Regina

Info DESIGNS®
445 Enterprise Court, Bloomfield Hills, MI 48013
(800) 445-INFO

Registered Trademark: Commodore–Commodore Electronics Limited. Trademarks: The Negotiation Edge, The Sales Edge, The Communication Edge, and the Management Edge products–Human Edge Software Corporation–developed exclusively for Info Designs on the Commodore 64/128; WordPro III Plus–Professional Software–licensed to Info Designs.


Commodore
POWER
RETURN
SHIFT
SHIFT LOCK
RUN STOP



Magic

By LOUIS F. SANDER

In this special issue, we've prepared a collection of 512 valuable hints and tips for Commodore owners. The following section contains all the Magic tricks published during 1985, plus over 200 new tricks prepared especially for this issue. Whether you're a new or experienced Commodore computer owner, a hardware or software devotee, a dedicated hacker or a once-a-year computerist, you'll find many tricks here that will make your computing more enjoyable and useful.

Table of Contents

Computer-Specific Tricks

1. Computers—C-64
2. Computers—C-128
3. Computers—Plus/4 and C-16
4. Computers—SX-64
5. Computers—VIC-20

Hardware Tricks

6. Connectors and Cabling
7. Datassette Recording
8. Disk Directories
9. Disk Handling and Storage
10. Disk Operations
11. Hardware—General Hints & Tips
12. Joystick Port Peripherals
13. Keyboards and Keyboarding
14. Modems and Telecommunications
15. Power Supplies
16. Printer Paper and Ribbons
17. Printers and Printing
18. Video Displays and Loudspeakers

Software Tricks

19. Entering Programs
20. Languages—Basic
21. Languages—Machine Language
22. Languages—Other
23. Programming Tips—Debugging
24. Programming Tips—General
25. Programming Tips—Mathematical
26. Programming Tips—Screen Display
27. Programming Tips—Sound
28. Programs—Amusements and Delights
29. Programs—Commercial Software
30. Programs—Useful Applications
31. Programs—Utilities
32. Word Processing

Miscellaneous Tricks

33. Computer Room Hints
34. Magazines and Books

1. Computers—C-64

DOS wedge command summary—The accompanying table lists all the important wedge commands. In general, the @ can be followed by any command string recognized by the 1541 drive.

DOS 5.1 Wedge Commands

COPY A FILE	@C:newname = oldname
DIRECTORY	@$ or @$: or @$:filename
ERASE DIRECTORY FROM DISK	@N:diskname
FORMAT A DISK	@N:diskname,ID
INITIALIZE DISK DRIVE	@I
LOAD A BASIC PROGRAM	/filename
LOAD & RUN A BASIC PROGRAM	!filename
LOAD MACHINE LANGUAGE	%filename
QUIT THE WEDGE PROGRAM	@Q
READ ERROR CHANNEL	@
RENAME A FILE	@R:newname = oldname
SAVE A BASIC PROGRAM TO DISK	←filename
SAVE WITH REPLACE (dangerous!)	←@:filename
SCRATCH A FILE	@S:filename
SET ACTIVE DEVICE NUMBER	@#n
SPEED CHANGE—C-64 SPEED	@UI+
SPEED CHANGE—VIC-20 SPEED	@UI-
VALIDATE DISK	@V

Notes

1. In using the wedge, the > symbol may always be substituted for the @ symbol.

2. This table uses FILE to refer to anything recorded on disk, whether it is a program or any type of datafile. Similarly, filename indicates the name of a program *or* datafile.

3. In general, the pattern-matching (*) and wild-card (?) characters can be used in reading filenames, but not in writing them.

4. The material following the @ or other special symbol may be enclosed within quotes if desired. The quotes can be helpful when filenames include leading spaces or other unusual characters.

5. If you desire, 0 or 1 can be inserted, just before any colon, to indicate the drive number in a multi-drive disk unit. Drive numbers are never necessary with the 1541 disk unit.

6. Use of the Save with Replace function is not recommended, since it occasionally corrupts a disk.

Louis F. Sander
Pittsburgh, PA

DOS wedge improver—This program changes the C-64's DOS 5.1 program so it can be easily saved onto other disks. Here's how to use it:

- Put the test/demo disk into your drive
- Type LOAD "DOS 5.1",8,1 {RETURN}
- Type NEW {RETURN}
- Load and run this program
- Insert a formatted disk onto which you want to save DOS 5.1
- Type SYS 52224 {RETURN}
- Type SYS 52400 {RETURN}

DOS 5.1 will now be saved onto the disk in your drive, and the C-64 will be reset. If you want to save the DOS onto another disk at this time, just put the new disk in the drive, and resurrect your wedge by entering these commands:

```
SYS 52224 {RETURN}
@#8 {RETURN}
```

Then save it by typing SYS 52400 {RETURN}. You can repeat these steps as many times as you like; many people put a copy of DOS 5.1 on every disk they own.

Once DOS 5.1 has been saved on a disk, you can also save Test/Demo's Basic loader, named C-64 Wedge, if you choose to. Since C-64 Wedge is a Basic program, saving it is a simple matter. When loading DOS into memory, you don't need the loader at all if you type:

Circle 415 on Reader Service card.

FOR COMMODORE 128 AND C-64 OWNERS ONLY:

JCT-1002™

3.7 Megabytes of Hard Disk Ready for the Commodore 128 or Commodore 64

It's the Largest

Yes, the Skyles Electrics Works interfaced **JCT-1002** is the largest hard disk drive available for the **Commodore 64** and **Commodore 128**, at a price under $800. How large? 3.7 million characters of storage. 21 times larger than the 1541 disk drive. Turn it on to format the disk and the directory says 14400 blocks free! No, this is not an expensive hard disk, it is ready to plug into your **C-128** or **C-64** for less than $800. Physically it's about twice as tall as a 1541 disk drive, but it holds over 21 diskettes of information. Just think of it as twenty-one 1541s stacked into the space of two.

It's the Fastest

Yes, the specially modified MERCURY interface makes this the fastest loading and saving hard disk drive available for the **C-64** or **C-128** computers. Over 12 times faster program and file loading than a 1541 disk drive. Four times as fast as a **1541 FLASH!** We made it this fast because, frankly, the advantages of a large disk memory almost disappear unless you have rapid access to the data.

It's the Most Useable

Visualize for a moment having over 3.7 million bytes of storage on one disk. Imagine never having to change a diskette again. Imagine over 20,000 mailing labels on one disk using Busidata and the **SEW/JCT-1002**. Imagine all the accounting data for a medium sized business on one data disk. Imagine all the programs you have ever developed or obtained from public domain on one disk. Imagine 125 full sized VIZAWRITER files (over 1800 pages) on one disk. These are but a few of the things that you could do with this disk drive. And at an amazingly low price!

C-64 or C-128

It's the Least Expensive

Yes, on a price per character of storage basis, the Skyles Electric Works **JCT-1002** is the least expensive disk drive available for the C-128 and C-64.

It's the Most Enjoyable

Until one has experienced a large disk drive, one has not experienced real computing joy. Buy the **SEW/JCT-1002** hard disk drive system, plug it in, turn it on, and start sharing the joy. We furnish every thing you need to get started: disk drive, interface to **C-128** or **C-64**, instruction manual, and test/demo program. Order now and share the joy.

		FALL SALE
SEW/JCT-1002 Disk Drive System, C-123	$899.00	799.00*
SEW/JCT-1002 Disk Drive System, C-64	899.00	799.00*

2 for 1 MONITOR CABLE™ for the Commodore 128

Commodore's Goof!!

Every new Commodore computer usually contains some small oversight or goof. At Commodore these are known as "oops!". The Commodore 128 is no exception!! There is no practical way to go between the 40 and 80 column modes of operation with a single standard monitor. Commodore's answer is that you buy 2 monitors and 2 cables, or buy the rather expensive C-1902 color monitor.

Skyles' Secret!!

We love Commodore's goofs!! We look forward with anticipation to each new Commodore Computer, eagerly awaiting a new crop of goofs. We correct Commodore's goofs and doors for fun and profit. The Skyles Electric Works **2 for 1 Monitor Cable** is our first oops! correction for the C-128.

Saves Monitors

The **2 for 1 Monitor Cable** allows all composite video monitors, the standard type, to be used with the Commodore 128 computer *in all modes of the C-128 operation*. The **2 for 1 Monitor Cable** eliminates the necessity to manually unplug and plug different monitor cables when you go between 40 and 80 columns modes of the C-128 computer. Don't throw out your present green, amber or color monitor, buy a **2 for 1 Monitor Cable**.

Fabulous Features

- Works with all modes of the Commodore 128: C-64, C-128/40, C-128/80, C/PM/40, and C/PM/80.
- Easy access gold contact switching between modes, no cables to plug-unplug.
- Furnishes a SOUND input to the monitor in all modes of the Commodore 128 operation.
- Works with all normal (composite video input) monitors.
- Works with C-1701, C-1702, Amdek, BMC, NAP, etc. monitors.
- Works with all normal (composite video input) green and amber monitors.
- Easy installation, plug in three plugs once.
- One year parts and labor guarantee.

Saves Money

Available now for a small fraction of the cost of new monitor.

		FALL SALE
2 for 1 Monitor Cable, C-128	$29.95	24.95*

EXCLUSIVELY

So many cartridges, so little space . . .

Skyles Electric Works to the rescue, with our **2+1**™ and **4+1** expansion boards for the C-64. Briefly the **2+1** gives you 2 vertical and 1 horizontal fully switchable cartridge ports. The **4+1** continues the tradition with 4 vertical and 1 horizontal cartridge ports. See the inside front cover for more details.

C-64 or C-128

		FALL SALE
Skyles 2+1 Expansion Bd. C-64	$49.95	39.95*
Skyles 4+1 Expansion Bd. C-128, C-64	$89.95	69.95*

*There is an additional $4.50 U.S. and Canada, $15.00 Europe and Asia, shipping charge per order. California residents add sales tax.

Skyles Catalogue Page 3

From Skyles Electric Works, the oldest and largest professionals in the business.

This is just a few of the 200+ bargains from the newest and biggest Skyles catalog, hot off the press.

We know you'll want this page, in its full splendor, and the other pages overflowing with over 200 bargains in peripherals, software, and books that will make your Commodore 128 or C-64 computer even nicer to live with.

So, if we missed sending you your very own copy within the last few weeks, call us at 1-800/227-9998, unless you live in California, in which case call 1-415/965-1735.

Skyles Electric Works
231E South Whisman Road
Mountain View, CA 94041
(415) 965-1735

```
LOAD "DOS 5.1",8,1 {RETURN}
NEW {RETURN}
SYS 52224 {RETURN}
```

When you see the DOS 5.1 prompt, you're in business, just as if you'd used the loader.

The best way to learn about the wedge is to read "Mysteries of the Wedge Revealed" (*RUN*, September 1984).

```
10 REM{2 SPACEs}DOS IMPROVER
20 REM{2 SPACEs}CREATED BY LOUIS F. SANDER
30 FORA=1TO69:READB:C=C+B:NEXT:RESTORE
40 IFC<>7162THENPRINT"DATA ERROR":STOP
50 FORA=1TO32:READB:POKE52346+A,B:NEXT
60 FORD=1TO37:READE:POKE52399+D,E:NEXT
91 DATA 141,068,079,083,032,053,046,049
92 DATA 032,045,032,083,089,083,032,053
93 DATA 050,052,048,048,032,084,079,032
94 DATA 083,065,086,069,141,000,000,000
95 DATA 169,008,170,160,255,032,186,255
96 DATA 169,007,162,124,160,204,032,189
97 DATA 255,169,000,133,034,169,204,133
98 DATA 035,169,034,162,090,160,207,032
99 DATA 216,255,076,226,252
```

Louis F. Sander
Pittsburgh, PA

DOS wedge loader—There are several ways you can improve the C-64 wedge loader program. First, you can change its name to something easy to load, like "!".

And you can add the following line, which will automatically print the directory command on screen, allowing you to load the directory just by pressing the return key.

```
25 PRINT "@$ {3 CRSR UP}"
```

If you have two drives, you can change the following line to have your wedge sense the active drive and load the DOS program from it.

```
10 IF A = 0 THEN A = 1 : LOAD "DOS 5.1",PEEK(186),1
```

The change, of course, is to substitute PEEK(186) for 8.

Finally, if you'd rather your screen colors be something other than blue on blue, you can add a line to change the colors to your favorites.

David E. Cox
Richmond, VA

DOS wedge reactivation—After a reset or the @Q command has deactivated the wedge, you can reactivate it by doing a SYS52224, then entering @#8. The SYS reenables the machine language program, while the @#8 assigns it to drive 8.

Mary Ivy Bayard
Norristown, PA

DOS wedge directory freezer—When you use the wedge to list a directory to the screen, you can use the space bar to freeze the listing for your careful perusal. Pressing the space bar again will continue the listing.

William F. Sander
Marietta, OH

DOS wedge volume identifier—Commodore's famous wedge program contains a not-so-famous way of organizing files on the disk. When using the wedge to save, if you end your filename with a single character enclosed in square brackets, that character will magically be moved to the sixteenth position in the filename!

In wedge jargon, that sixteenth character is called the volume identifier. If you save several files with the same volume ID, the wedge will let you access them as a group.

If you're saving without the wedge, you can manually put a volume identifier in the sixteenth position of your filename, so you can use it later on.

To use the volume identifier, you must be running the wedge, and you can use any wedge command, including @COPY, @RENAME, @SCRATCH and especially @$. The wedge looks for the last character in each filename when you specify a volume ID between the square brackets. For example, you can save a file by entering:

{LEFT ARROW}HOUDINI[L]

It will list in the directory as

HOUDINI {8 spaces} L

and can be scratched with:

@S:HOUDINI[L] {return}

To get a directory of all files with volume identifier L, use:

@$:*[L] {return}

You can scratch all the files with volume identifier L by using:

@S:*[L] {return}

Beware: The dark side of this magic is that the wedge will report the sixteenth character of the filename as the volume ID, whether it is intended as such or not. Make your IDs unique (graphics characters, for instance) and this should be no problem.

Matthew J. McCaffrey
Groton, CT

DOS wedge commands in programs—Wedge commands can be used from within Basic programs, as long as the proper syntax is used. The @, >, /, % or up-arrow symbol must be the first character in the statement, with no quotes around it. The rest of the command must be enclosed in quotes. The following routine, for example, will put a directory on the screen, read the error channel, print a message, then load a program.

```
200 @ "$"
210 @
220 PRINT "WIZARDRY, INDEED!"
230 / "THE LAND OF OZ"
```

With normal Program mode loads, you must be concerned about program length; with this one, you don't. The technique has worked with every wedge command we've tried it on.

Arnie Lee
Abacus Software

Drive not ready—Some disk operations confuse the 1541 disk drive, resulting in a maddening Drive Not Ready error. If you're using the wedge, this can be easily remedied by typing @UJ. It causes the drive to reset itself and is an easy way out of most 1541 quirks.

John Patrick
Bourbonnais, IL

Reset buttons—One feature that Commodore left off the VIC and C-64 was a reset switch. The reset line comes out to several connectors on both machines, and, if you rig a momentary switch to ground it, you'll have a reset button.

Now Available Through Aquarian Software

Gold Disk Series

Volumes 1 through 11 Now Available!!!

Volume 11 Features a C-64 Assembler

Each Disk Contains:

- The Monthly Feature Program
- Programming Tutorials
- High Quality Games
- And Much More

Gold Disk Series for 128
Coming Soon!

Only $14.95 Per Disk*

* Plus Shipping and Handling

The Cataloger

The Ultimate Disk Cataloging System for the 64!

Features of The Cataloger V3.5A Include:

- ★ Loads directly from the disk itself.
- ★ Ability to change name of entry.
- ★ Fast — Uses relative files exclusively
- ★ Search, Sort and Print by any of 12 fields.
- ★ 1100-program (or disk) capacity per data disk.
- ★ All machine language.
- ★ Menu driven — very easy to use.
- ★ Works with one or two drives.

Only $24.95

BobsTerm Pro

The Ultimate Terminal Software !

Upload / Download Supports Punter, X-Modem, XON / XOFF, DC1 / DC2, and Much More!

28.5 Byte Buffer with unmatched editing abilities

- User Adjustable Parameters
- 10 Custom Character Sets
- Unlimited Phone Book Storage
- Programmable Macro Command Strings

Only $59.95

MATRIX — NOW AVAILABLE!!

The Indispensable C-128 Utility / Starter Kit !

Use **dozens** of 128 features in the 64 mode:

- Numeric Key Pad
- Cursor Keys
- 80-Column RGB Output
- Many Other Special Function keys

One-Key Functions Include:

- **2 Megahertz "Fast Mode"**
- **One-Key Screen Dumps**
- **Full-Featured DOS Utility Menu**

Other Features Include:

- Fast Loading
- Fast Copy For The 1571!
- Relocatable In Memory
- 100% Transparent to BASIC

Available Now For Only $59.95

Graphic Screen Exporter

A Universal Graphics Converter !

Converts Anything to Anything — Including:

Koala Pad	Doodle
Flexidraw	Print Shop
COMAL	Paint Magic
CAD GEM	Micron Eye

And Many Many More ! !

The Most Versatile Graphics Utility Ever Released for the Commodore 64 !

Only $29.95

ALSO AVAILABLE:

OmiTerm.....$19.95
Full-Feature Terminal at an Affordable Price!

Turbo Calc/64.....$17.95
A great spreadsheet at an Unbelievable Price!

Tax Computation.....$29.95
The friendliest tax package on the market.

Guitar Master.....$49.95
A comprehensive musical instruction package

Fast Boot!.....$14.95
Mike J. Henry's Fast Loader for 1541/MSD

Thriller Collection.....$24.95
Seven intricate text adventures on one disk

Call or Write for Full Catalog !

CAD-GEM

Computer Assisted Design
Graphic Element Manipulation

A Wire Frame CAD system for the C64 !
Input from Joystick, Track Ball, Light Pen or Graphics Tablet
360 Degree Rotation in .1 Degree Increments
Scaling on a 64K x 64K, 2048 Mega-Bit Virtual Screen
Independent Manipulation of 400 Objects (Points or Lines)

You must see CAD GEM to believe it!
Demo Disk Available for $3.00

$89.95

MODEM MASTER

The Friendliest Commodore BBS Available

- Works with 1541 or MSD Dual Drive
- 300 / 1200 Baud Operation
- New Punter File Transfer Protocol
- Sub-Directories for File Transfer
- 250 User Capacity
- Accurate Clock / Calendar
- Printer Output
- Information Files
- "Old" E-Mail Deleted After One Week
- Set Up In Only 10 Minutes !

Only $29.95

Total Software Development System

by Kevin Pickell
Now Available in the States !

Assembler/Editor — fast load, get, log and loadat; adds 38 new commands; full macro instructions; allows 13-character labels; assembles to and from disk
Sprite Editor — 256 sprites in memory, view 64 at same time, works with keyboard, joystick or trackball, animates sprites during design
Unassembler — create source code from any ML program
Sound Editor — create interrupt-driven sound effects
Character Editor — edit all characters. Screens to 255x64. Hi-res & Multi-color Character Sets

TSDS automatically includes sprites, characters, mattes and sound effects into source code!

Only $39.95

128 Version Coming Soon !

Aquarian Software
P.O. Box 22184
Portland, OR 97222

VISA

To order, Call: (503) 654-2641
VISA & MasterCard Accepted

MasterCard

Add 3.00 S & H Per Order
(Add Additional $2.00 for COD)
Canadian Orders Add 10.00 S&H
Allow 3-4 Weeks For Delivery

Write or Call for Full Catalog — Dealer Inquiries Welcome !

The preferred approach is to wire the switch to a separate connector that you plug into the machine as needed. The undesirable alternative is to solder a switch directly to the computer. This may make it difficult to get repair service, should you ever need it.

Resetting either machine restarts it with the familiar Bytes Free message you see when you first turn on your computer. Basic's pointers are reset to their power-up values, but user memory isn't disturbed. So, a reset gets the computer out of any bizarre states in which you've put it and gives you a chance to recover your program. Here are your three choices on connecting the switch:

1. On either machine, between pins 2 and 6 of the serial I/O port. This is a good choice, because the connector can be inserted only one way and because this port is available on the computer *and* on the disk drive, if one is connected.

2. On either machine, between pins 1 and 3 of the user I/O port. This is less desirable, because some user port connectors can be inserted upside down, wiring your switch to an unintended, potentially disastrous place.

3. Between pins A and C of the C-64 expansion slot or between X and Z of the VIC expansion slot. Depending on your connector, this method may or may not share the hazards of the one above.

People find many locations for installing reset switches, such as inside a DIN connector or a defunct cartridge (cut the traces from the unused contacts); the serial bus cable, between the red and green wires; or in a modem or other external device.

Tom Hoppe
Spokane, WA

Safer reset switch—When I installed a reset switch on my C-64, I wanted to be certain it would never be accidentally pushed. I therefore installed two push buttons in series; this requires that both be pushed at once for a reset to occur. I located them on the back of the computer, about 11 inches apart, so there's no danger of pressing them both by mistake.

Charles Patterson
Tarrytown, NY

Resets on newer C-64s—The newer C-64 computers (manufactured around October 1984) will not reset with the usual serial port reset, because there was a change in the reset circuit. You can go inside the computer, however, to find a connection for your reset button. Near pin 8 of chip U20 (#556 chip) is capacitor C34, a 0.1 microfarad unit. Wire a momentary SPST normally open pushbutton across this capacitor, and you'll have your reset button. It has worked well for me with no ill effects.

George M. Titus
Selden, NY

C-64 warm/cold starts—There has been much confusion over the proper SYS calls to reset the Commodore 64. While there may be variations due to differences in ROM versions, the following SYS calls perform as specified on my own machine and those of friends.

SYS 64759 acts the same as pressing stop/restore. It resets the video colors and sound chip, clears the screen and gives a Ready prompt. All programs remain untouched in memory.

SYS 64738 simulates turning the computer off then on, but neither destroys memory from start of Basic (2048 decimal) upward nor resets the serial bus or its peripherals. It overwrites the cassette buffer, destroying any machine language programs there. It does not destroy Basic programs, but because all pointers are reset, they appear to be erased. (An Unnew program will recover them.) If a cartridge is in place, this reset will restart it.

SYS 64760 does not destroy the cassette buffer or anything above it. It does not destroy Basic programs, but because all pointers are reset, they appear to be erased. (An Unnew program will recover them.) This SYS call disregards any cartridge that may be installed; initializes I/O vectors and resets colors; gives the Bytes Free message when finished; does not check for a cartridge and bypasses it if it is installed; and works very fast.

SYS 64763 works as 64760, but does not reset I/O vectors.

Berthold Trenkel
Goeppingen, West Germany

Reset tip—The C-64 Reset command SYS 64738 will not disturb most machine language programs in memory, but it does seem to wipe out anything in the cassette buffer, locations 828–1019 decimal. Safe areas for machine language programs are Basic RAM, 2048–40959, and alternate RAM, 49152–53247.

Peter Heine Jorgensen
Aarhus, Denmark

Pokepourri—Here's a collection of C-64 Pokes that have been sent to us over the years. Although we've briefly tested each one, we can't guarantee them against unexpected side effects.

POKE	Effect
19,65	Inputs without question mark
19,0	Restores the question mark
22,35	Lists without line numbers (Syntax error restores them)
120,0	Mindless printing machine
198,0	Clears keyboard buffer
199,1	Prints in RVS mode
199,0	Turns RVS off
211,X	Cursor to row X
214,Y:PRINT	Cursor to column Y
212,0	Disables Quote mode
646,X	Changes cursor color (X = 0 to 15)
649,0	Disables keyboard
649,10	Enables keyboard
650,0	Normal repeat
650,64	No keys repeat
650,128	All keys repeat
657,1	Disables shift/Commodore keys
657,0	Enables shift/Commodore keys
774,0	Lists only line numbers
774,26	Resets the above
774,131:775,164	Disables List
774,226:775,252	List gives cold start
775,168	Disables List
775,191	Disables List
775,200	Disables List
775,167	Enables List
788,52:808,239	Disables Stop
788,49:808,237	Enables Stop
792,193	Disables Restore
792,71	Enables Restore
793,203	Disables Restore
808,127	Disables Run

MUST LIQUIDATE At Far Below Dealer Cost!
TOTAL Personal Computer System

Factory Reconditioned with Factory Warranty!

Carries easily as a suitcase!
Plugs into 115V outlet!

GREAT GIFT IDEA!

Sorry, we're not permitted to PRINT the famous brand-name. BUT, we CAN "tell all" if you call us TOLL FREE: 1-800-328-0609!

THE COMPUTER

Snap-on computer keyboard! 64K RAM, 20K ROM. Full-size typewriter keyboard. Upper and lower case letters, numerals, symbols, reverse characters. 2 cursor control keys, 4 function keys, programmable to 8. Music synthesizer with 3 independent voices, each with 9 octave range. Input/output ports accommodate . . . user, serial, ROM cartridge, joysticks, external monitor, phone modem.

Built-in disk drive! Intelligent high speed unit with 5¼" floppy disk recorder. 170K formatted data storage; 35 tracks. 16K ROM. Uses single sided, single density disk. Serial interface. Second serial port to chain second drive or printer.

Built-in color monitor! Displays 40 columns x 25 lines of text on 5" screen. High resolution. 320 x 200 pixels. 16 background, character colors.

Built-in ROM cartridge port! Insert ROM program cartridge. Multitude of subjects available in stores across the nation!

Original List Price $995.00

Liquidation Priced At Only **$388**

Item H-816-63631-00 Ship, handling: $20.00

THE PRINTER

Print method: Bi-directional impact dot matrix.
Character matrix: 6 x 7 dot matrix.
Characters: Upper and lower case letters, numerals and symbols. All PET graphic characters.
Graphics: 7 vertical dots — maximum 480 columns. Dot addressable.
Character codes: CBM ASCII code.
Print speed: 60 characters per second.
Maximum columns: 80 columns.
Character spacing: 10 characters per inch.
Line feed spacing: 6 lines per inch in character mode or 8 lines per inch selectable. 9 lines per inch in graphics mode.
Line feed speed: 5 lines per second in character mode. 7.5 lines per second in graphics mode.
Paper feed: Friction feed.
Paper width: 4.5" to 8.5" width.
Multiple copies: Original plus maximum of two copies.
Dimensions: 13"W x 8"D x 3¼"H. Wt.: 6½ lbs. **Power:** 120V AC, 60 Hz.

Original List Price: $200.00

Liquidation Priced At **$119**

Item H-816-63831-00 Ship, handling: $7.00

THE SOFTWARE

"Easy Script" One of the most powerful word processors at any price! Cut re-typing, create documents from standard paragraphs, do personalized letters, see and change a document before it is printed. Instruction manual has extensive training section that simplifies use . . . even for someone who has never used a computer or word processor before!

"The Manager" A sophisticated database manager for business or home use. Business uses: accounts payable/receivable, inventory, appointments, task manager. Home uses: mailing lists, home inventory, recipes, collection organizer, investment tracking, checkbook balancing. School uses: research article index, gradebook.

Mfr. Sug. Retail: $73.98

Liquidation Price **$24**

Item H-816-64011-03 Ship, handling: $3.00

BUY INDIVIDUAL UNITS OR GET THIS ULTRA-FAMOUS SYSTEM AT ONE LOW PACKAGE PRICE!

TOTAL Personal Computer System available at FAR BELOW dealer cost!

Original List Price $1,293.00

TOTAL PACKAGE PRICE **$488**

Item H-816-64011-02 Ship, handling: $24.00

Compatible with above Computer System (Not included in package price.)

JOYSTICKS (Set of 2)
Mfr. List: $59.90 pr.
Liquidation Price . . . . . **$19** pr.
Item H-816-63622-01 S/H: $4.00 pr.

64K MODEM (Factory New/First Quality) Limited 90-Day Factory Warranty.
Mfr. List: $124.95
Liquidation Price **$19**
Item H-816-63646-00 S/H: $4.00

VISA MasterCard

Credit card members can order by phone, 24 hours a day, 7 days a week.

Toll-Free: 1-800-328-0609

TeleCheck Your check is welcome! No delays when you pay by check!

C.O.M.B. Direct Marketing Corp.
Authorized Liquidator
14605 28th Ave. N. • Mpls., MN 55441-3397

SEND ME THE ITEMS I HAVE LISTED BELOW
Sales outside continental U.S. are subject to special conditions. Please call or write to inquire.

Item No.	#	Item	Price	S/H
		TOTAL		

C.O.M.B. Direct Marketing Corp. Item H-816
14605 28th Ave. N./Minneapolis, MN 55441-3397

Send the items indicated at left. (Minnesota residents add 6% sales tax. Please allow 3-4 weeks delivery. Sorry, no C.O.D.)

☐ My check or money order is enclosed. (No delays in processing orders paid by check, thanks to TeleCheck.)

Charge: ☐ MasterCard ☐ VISA

Acct. No _____ Exp _____

PLEASE PRINT CLEARLY

Name _____

Address _____

City _____

State _____ ZIP _____

Phone ( ) _____

Sign Here _____

808,234	Disables Stop/Restore/List
808,225	Disables Stop/Restore
808,239	Disables Stop (Stop/Restore ok)
816,157	Disables Load
816,165	Enables Load
818,131:819,164	Disables Save
818,226:819,252	Save gives cold start
818,32	Disables Save
818,237	Enables Save
819,246	Disables Save
819,245	Enables Save
819,245:818,32	Disables Save
819,245:818,237	Enables Save
53265,11	Turns off screen (Computer runs faster)
53265,27	Turns on screen (Alternative is Stop/Restore)
53272,21	Switches to Graphics mode
53272,23	Switches to Text mode
53280,X	Border color (X = 0 to 15)
53281,X	Screen color (X = 0 to 15)
56325,X	Changes cursor speed (0 = fast, 58 = normal, 255 = slow)

Various Contributors
All Across the Land

Easy RUN—Are you tired of typing R-U-N over and over again while working with Basic? Enter POKE 816,32 and your weariness will vanish. After that Poke, pressing the shifted run/stop key will automatically run your program! You can return to normal by POKE 816,165 or by hitting the stop/restore combination.

Craig Johnson
Juneau, AK

No-RUN fix—Occasionally, when working with machine language or screen memory, your machine may give a Syntax error in response to a Run or other Direct mode command. POKE 2048,0 usually cures the problem. This quirk occurs in many versions of Basic and arises because 2048 is the Start of Text position, which must always contain a 0.

Scott Farrar
Stockton, CA

C-64 uncrasher—When your keyboard locks up while you are typing, try typing {SHFT 3}. The screen should respond with "Press Play On Tape," and if you follow those instructions then press the stop key, you should be able to continue your work.

Douglas P. Oesterle
Agana, Guam

Calculated Goto command—On the C-64, you can use this one-liner to jump to any calculated line number within your program. Simply set the variable GL to the desired line number, then enter GOTO 1000.

```
1000 POKE 785,188 : POKE 786,168 : POKE GL,PEEK(GL) :
     GL = USR(0)
```

It may not look like it, but believe me, it works! [Yes, it does! Ed.]

Randy Thompson
Eugene, OR

Program executable List—This lets you use the List command within a C-64 program, without halting the program's execution. Substitute line numbers for the Xs or leave them out entirely.

```
100 POKE 768,174 : POKE 769,167 : LIST XXXX - XXXX : POKE
    768,139 : POKE 769,227
```

Randy Thompson
Eugene, OR

Simplest trace—Whenever the C-64 executes a SYS 48578, it prints the word IN and the line number in which the command appears. By including these SYS calls at various points in your program, you can find what has been executed and when. An even slicker method is to set T = 48578, and execute SYST any time you want to trace.

Dennis J. Spranger
Eland, WI

Error messages—Memory location 157 ($9D) controls whether or not error messages and control messages will be displayed on the screen. In Direct mode, for instance, Loading, Searching and Found messages are displayed, while in Program mode they are suppressed, all because of different values Poked into location 157. You can control the display yourself as follows:

```
POKE 157,0—Suppress all messages
POKE 157,64—Enable error messages
POKE 157,128—Enable control messages
POKE 157,192—Enable error and control messages
```

Mike Tranchemontaigne
Nashua, NH

Closing files—The well-known SYS65511, often said to close all files, really doesn't do that. It causes the computer to forget its opened files, but does *not* signal the peripherals to close them. While some may call this a minor difference in semantics, it can be disastrous when disk files are involved. The following one-liner is the easiest and most effective way I've found to close all open files at once, regardless of what files they are or when and where they were opened.

```
X = PEEK(152) : FOR J = 1 TO X : CLOSE PEEK(601) : NEXT
```

Location 152 contains the number of currently open files. The ten-byte queue starting at 601 contains their file numbers and works similarly to the keyboard buffer. As each file is closed, its entry is removed, and the rest are moved down one byte. If you enter the one-liner exactly as shown, you'll successfully close all files.

By the way, POKE 152,0 yields the same results as SYS65511. In fact, that is exactly what SYS65511 does.

Charles Lavin
Coral Gables, FL

ROMwriter—It's often useful to write the C-64's ROM programs into the underlying RAM, usually by entering something like:

```
10 FOR J = 40960 TO 49151 : POKE J,PEEK(J) : NEXT
```

This takes over 30 seconds to accomplish, but there's a way to do it in less than a second, using Basic's own mass-move routine, located at 41919. Here's how:

```
10 POKE 95,0 : POKE 96,160
20 POKE 90,0 : POKE 91,192
30 POKE 88,0 : POKE 89,192
40 SYS 41919
```

ATTENTION

Foreign Computer Stores
Magazine Dealers

You have a large technical audience that speaks English and is in need of the kind of microcomputer information that CW/Peterborough provides.

Provide your audience with the magazine they need and make money at the same time.

For details on selling **80 MICRO, inCider, HOT CoCo, RUN and AmigaWorld** contact:

SANDRA JOSEPH
WORLD WIDE MEDIA
386 PARK AVE., SOUTH
NEW YORK, NY 10016
PHONE (212) 686-1520
TELEX—620430

Circle 447 on Reader Service card

A REAL-TIME WW II SUBMARINE SIMULATION

DAWN PATROL

As Commander of a World War II attack submarine, the player must outwit the enemy ships whose positions and actions are calculated by the computer. While many factors such as fuel, torpedos, damage, and locations of enemy vessels must be considered in planning a strategic attack, the simulation is easy to learn at the lower difficulty levels. Features include:

- ✳ SUBCOM assigned missions such as 'seek and destroy' operations, patrolling enemy sea lanes, rescue missions, or 'cloak and dagger' spy missions.
- ✳ Computer generated speech simulates actual radio transmissions. The player must decide whether the broadcast is a legitimate assignment or a trap being set by the enemy.
- ✳ Multiple screens include: control panel and periscope view, chart of sub's patrolling area, radar display, and damage schematic.
- ✳ Full color graphics with three dimensional object perspective providing depth of field.
- ✳ Trigonometric transformations precisely plot each object in real-time.
- ✳ Computer algorithms 'think' for the enemy, allowing them to hunt and attack your submarine if detected.

C64 and C128 Disk or Cassette $24.95

The Ultimate Party Game for 1-6 players or teams ages 13 and older

- ✳ Over 4000 Questions and Answers
- ✳ Game Master Controls the Play
- ✳ Double or Lose It Bonus Questions
- ✳ Catch Up the Loser Sequence
- ✳ Tie Breaker Function
- ✳ Help and Save Features

Trivia Flight

C64 and C128 3 Disks $26.95

MARK OF THE FALCON
2190 West Drake, Suite 177
Fort Collins, Colorado 80526
(303) 226-1960
VISA, MC, Money Order, Check

Circle 441 on Reader Service card.

THE Short Wave Listener FOR RECEPTION OF MORSE CODE & RADIO TELETYPE SIGNALS.

Plug the SWL cartridge into your Commodore "64" Expansion Port, connect a shortwave radio and you'll be watching text readout from weather stations, news services, ships and HAM radio operators all over the world. A whole new use for your home computer. The SWL contains both program in ROM and radio interface circuit to copy Morse code and all speeds/shifts of radio teletype. Plus the on screen tuning indicators mean you never have to take your eyes off the video for perfect tuning. Housed in a small 3"×2-1/2"×7/8" enclosure, with speaker in/out and practice hand key jacks, it needs no other computer connection or power supply. Unshift on space, word wrap around, real time clock, and keyword or manual printer control for permanent paper copy, so that you won't miss a single bit of the action. For about the price of another "Pac-Zapper" game, you can tie into the exciting world of digital communication with the Microlog SWL.

$64

MICROLOG
INNOVATORS IN DIGITAL COMMUNICATION
18713 MOONEY DRIVE
GAITHERSBURG, MD 20879 • (301) 258-8400

LEARN MORSE CODE THE RIGHT WAY WITH THE Morse Coach.

$49.95

A complete Morse code tutor in a convenient plug-in cartridge for your Commodore "64." The Morse Coach means business. It's not a toy program or a simple random code generator. Originally developed jointly by Microlog and several government agencies experienced in Morse instruction. Four years of extensive service prove it's the quickest way to Morse proficiency. The method works! You start from absolutely no knowledge of Morse, progress through the alphanumeric symbols, and on to any speed desired. The "alphabet" part of the program introduces new characters and plots the progress on a bar-chart. The speed/test section correlates the input, analyzes mistakes and provides a printout of the analysis/test results on your Commodore screen or printer. As a bonus, it also boosts typing skill. You've never seen *any* tape or program do that! In fact, there's never been a system so thorough, so efficient and so effective as the Microlog Morse Coach.

Line 10 points to the start of the code to be moved, and line 20 points to the byte one location higher than its end. Line 30 points to the byte one location higher than the end of its new position. (In this case, these are 40960, 41952 and 41952, respectively.) The SYS initiates the movement.

The same routine, with different pointers, of course, can be used to move other areas of memory. Because of the techniques used, moves in a downward direction will succeed only if the source and destination areas do not overlap.

James Pellechi
Middle Island, NY

False autostart—This program will trick the computer into thinking that an autostart ROM cartridge is in place. Whenever the restore key is pressed, the computer will execute a machine language program pointed to in 32770–32771.

```
100 REM FALSE AUTOSTART-CURTIS NELSON
110 FOR J=32772 TO 32776 : READ K : POKE J,K : NEXT
120 POKE 32770,0 : POKE 32771,192
130 DATA 195,194,205,056,048
```

Line 110 tricks the computer by putting the word CBM80 starting at location 32772. Line 120, which you can change to suit your machine language program, tells the computer that the target machine language is at 49152.

Curtis Nelson
Tremonton, UT

Program password—I recently devised a security lock system for my programs. Now, persons not knowing the secret code are prevented from using my programs. The code is any number; where the program below says "code," just plug in a number. The program should be inserted before the main program.

```
1 POKE 800,100 : POKE 819,245
2 INPUT"{SHFT CLR}ACCESS CODE";A
3 IF A <> code THEN NEW
4 Continue the program here
```

Sean Fitzpatrick
St. John's, Newfoundland
Canada

C-64 cursor tricks—You can speed up your cursor with POKE 56341,1. You can slow it down with POKE 56341,255. If you combine these tricks with POKE 650, any value over 127, you'll discover some real fun.

Harry I. Papatheofilopoulos
Peristeri, Greece

Screen gem—My junior high school students find it greatly entertaining and informative to enter POKE 53265,59 and then to type on the C-64 keyboard. Pressing the run/stop and restore keys gets you out.

Katherine Prescott
Coos Bay, OR

Split screen—The following short routine, using what's called a raster interrupt, splits the C-64 screen into two different-colored sections. Lines 1–3 will detect typing errors in your Data statements; you should delete them when the program asks you to, then save the remaining lines as your master routine. It will be compatible with most Basic programs, especially the ones not involving machine language.

Delete lines 1–3 and run your program. Any time after doing this, you can split the screen by executing SYS 40800. The split will remain until stop/restore cancels it; it can be recalled by repeating the SYS 40800.

You can change the top color by changing the sixth item (002) in line 21, or, after running the program, by entering POKE 40877,c (where c is the number for the color you want). You can change the bottom color by changing the eighth item (007) in line 18 or by POKE 40855,c. The screen split can be after any line, and its location is controlled by the fifth item in line 13 (010 = split occurs after tenth line). To change the split location on an already-split screen, enter POKE 40812,n:SYS40800 (where n is the number of lines to appear above the split).

```
Ø REM SPLIT SCREEN - RICHARD RAPPACH
1 FORJ=1TO89:READA:B=B+A:NEXT
2 IFB<>9955THENPRINT"DATA ERROR":STOP
3 PRINT"DATA OK. DELETE LINES 1-3.":END
1Ø POKE56,159:POKE52,159
11 FORJ=4Ø8ØØTO4Ø888:READA:POKEJ,A:NEXT
12 DATA 12Ø,169,127,141,Ø13,22Ø,169,ØØ1
13 DATA 141,Ø26,2Ø8,169,Ø1Ø,Ø42,Ø42,Ø42
14 DATA 1Ø5,Ø5Ø,141,Ø95,159,141,Ø18,2Ø8
15 DATA 169,Ø27,141,Ø17,2Ø8,169,137,141
16 DATA Ø2Ø,ØØ3,169,159,141,Ø21,ØØ3,Ø88
17 DATA Ø96,173,Ø18,2Ø8,2Ø5,Ø95,159,2Ø8
18 DATA Ø21,169,ØØØ,141,Ø18,2Ø8,169,ØØ7
19 DATA 141,Ø33,2Ø8,169,ØØ1,141,Ø25,2Ø8
2Ø DATA 1Ø4,168,1Ø4,17Ø,1Ø4,Ø64,173,Ø95
21 DATA 159,141,Ø18,2Ø8,169,ØØ2,141,Ø33
22 DATA 2Ø8,169,ØØ1,141,Ø25,2Ø8,Ø76,Ø49
23 DATA 234
```

Richard Rappach
Youngstown, OH

COL to the colors—The following program makes it easy to set your C-64's border, screen and cursor colors. You can always set them by Poking locations 53280, 53281 and 646, but, when you hit the run/stop along with the restore key, your hues become blues, and you have to Poke again.

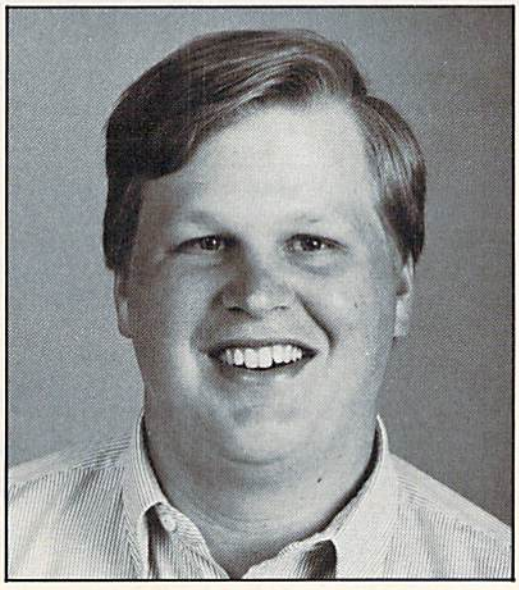
As printed, the program includes a checksum routine to verify the correctness of your Data statements. Run it, and if you get a Data Error message, check your typing. When your Data statements are correct, you'll be asked to delete lines 2–4. Do that, then save the resulting program.

When you run the data-verified program, it will ask for the colors you prefer; unless you like the defaults I've provided, you should respond with the Poke values of your favorite colors (see Appendix G of the user's guide). After that, any time you wish to set the colors, simply type COL and press the return key. The run/stop and restore keys will still give you the blues, but a COL will brighten your screen and your day. Unfortunately, COL doesn't work from inside a program. You can insert your own default values by plugging them into the initial statements of lines 50–70.

```
1 REM COL TO THE COLORS - ERIC BREAULT
2 FORJ=1TO92:READK:CS=CS+K:NEXT
3 IFCS<>1Ø512THENPRINT"DATA ERROR":END
4 PRINT"DELETE LINES 2-4":END
1Ø FORJ=49152TO4923Ø:READK:POKEJ,K:NEXT
```


Continued on p. 92.

His name is Chris Schmidt. His callsign is KA1MPL. He's a new ham-radio operator.



He uses a micro at work every day.
He learned Morse Code and radio theory in a month and took an FCC test.

For him, there's now more than hardware and software for fun. Like knowing what hams on bulletin boards really mean. Like meeting on the air another one of his 400,000 fellow ops. Like being prepared to help in an emergency.

Would you like to get started? We'll send you the name of a ham in your area who'll help.

American Radio Relay League
225 Main St., Box CS, Newington, CT 06111 (203) 666-1541

Presented as a public service by RUN and CW Communications/Peterborough.

Circle 432 on Reader Service card.

For the last two years, many software vendors have tried to make a disk utility more revolutionary than DI-SECTOR V2.0.

Now someone finally has!

DI-SECTOR V3.0

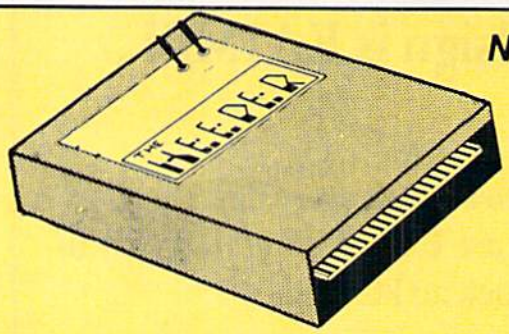
★ Unprotected disk copier archives disks in 48 seconds with verify!
★ Protected disk backup archives the latest disks in only 1 minute!
★ All copiers work with one or two 1541 disk drives.
★ Ultra fast file copier will copy between 1541, MSD, SFD 1001, hard disk drives, etc.
★ Full featured sector editor allows modification of sectors in ASCII, HEX & Assembler.
★ Powerful machine language monitor allows debugging of drive & computer code!
★ Block identifier utility allows the viewing of half-tracking, density switching, etc.
★ DI-SECTOR diskette NOT PROTECTED for unlimited archival backups!!
★ All these features, and more for only $39.95!

When updating by mail:
(UPDATES NOT ACCEPTED WITHOUT THE RETURN OF MASTER DISK)
★ $5.00 + 4.00 s/h
★ $5.00 + 5.00 COD orders
★ Shipping costs outside USA $6.00
★ Calif. residents add 6½ sales tax
★ VISA or Mastercard accepted

. . . WRITE OR PHONE . . .
STARPOINT SOFTWARE
122 S. Broadway Yreka, CA 96097 (916) 842-6183

When ordering by mail:
★ $39.95 + 4.00 s/h
★ $39.95 + 5.00 COD Orders
★ Shipping costs outside USA $6.00
★ Calif. residents add 6½ sales tax
★ VISA or Mastercard accepted

Circle 426 on Reader Service card.



NEW FOR C-64 and C-128

THE KEEPER

Revolutionary new technology enables virtual storage of 8192 bytes of high speed RAM. With write protect and in/out switches, the KEEPER adds new dimensions to your computing capability. Designed for the Commodore C-64 and C-128.

- Make Auto-Start Cartridges of Your Own Programs
- Built-in Software Mkes Use EASY
- Copy BASIC or Machine Language Programs
- Instant Program Recall
- May Be Used Over and Over
- Guaranteed for 1 Year

ONLY $39.95

MASTER LOCK

Here, at last, is a program that will protect your software programs from unauthorized duplicating. 1 to 1 million copies can be protected, fast and easy.

- Specially designed for the C-64 and 1541 Disk Drive.
- Completely encrypts and protects your programs.
- Fully compatible with almost all machine language and basic programs — can even support chained programs.
- Contains a special feature which protects your program from being 'broken.'
- Incorporates all the latest techniques in program encryption and protection.
- Each system has been specially prepared and is unique from all other systems — only **you** are able to make working duplicates of your own protected programs.
- Simple and easy to use — entirely menu drive with prompts.
- Will stop virtually all software copiers from duplicating your programs.
- Fast and reliable protection routine does not take away any useable space from your disk — all 664 blocks are available for use.
- Easy to follow step by step instructions are included on the disk.
- A **must** for all programmers who do not want their programs to be in public domain!

Even the "nibblers" can't copy them. Not even *Disk Maker, *Mister Nibbles, *Copy II, *Ultra Byte or *Fast Hackem. The time to protect you disk is only 5 (five) seconds and each Master Lock makes a different protection scheme. Only.

*Disk Maker™, Basix
*Mister Nibbles™, Full Circle
*Copy II™, Central Point Software
*Ultra Byte™, Ultra Byte
*Fast Hackem™, Basement Boys Software

$29.95

TOOL BOX

This disk has over 100 routines, some of them are routines for protection, smooth scrolling, modem routines, and sound and color routines; bootmaker, paddle and joystick; read terminal, auto dial, auto answer. They can easily be incorporated into all of your programs. It is also fully documented. With this disk alone you could build your own program. This disk has a lot of tricks that are used in commercial software.

$19.95

SWIFTERM AND MODEM

This is the best package anywhere!

SWIFTERM:
is absolutely the easiest terminal program available anywhere.

- Works with the 1660, and Westridge Modem
- New printer and midwestern protocal
- Printer dump
- DOS commands access from menu
- Phone book
- Auto dial (with auto redial)
- 29K storage buffer
- Save to disk
- Standard ASCII up/down loading
- 300/1200 Baud

This is an excellent easy to use program for a very reasonable price.

THE MODEM:
Auto dial, auto answer, 300 Baud modem that is 100% compatible with Commadors 1650 modem, so all our software will run with it.

ALL THIS FOR ONLY $35.96

So why buy just another terminal program when you can get a modem, too!?!

300/1200 BAUD

Modem for the C-64 **With Swifterm** **$169.00**

GRAPHIC LABEL MAKER

Give your labels the professional touch. With Hi Rez Graphics make your own design or use one our 60 premade labels with easy to use on screen editor. You can insert up to three lines of text then choose the picture you want to put on the left hand side of the label. Then you can print out as many labels as you want. This has got to be the neatest label program out there and it's only **$24.95**

*Now works with Print Shop

*Also available — the x-rated Graphic package for the 64 and your print shop. There's 60 Hi Rex pictures **$24.95**

1541 M.A.S.H.

Now you can service your own 1541 disk drive using 1541 M.A.S.H. Save big bucks on repair bills. Rate the performance of your drive. Test and adjust RPM's. Test and adjust head alignment. Step by step instructions that anyone can follow. Pays for itself the first time you use it to adjust a misbehaving drive. No knowledge of electronics is necessary. All you needs is a screwdriver and 20 minutes.

NOW ONLY $19.95

DISK TRACKER

Now you can log all of your disks into a neat filing system. Automatically record disk names and program titles. Allows you to quickly scan what you've got. Sorts titles; prints jacket covers; store up to 1600 disk directories on one disk. Search quickly through your entire disk collection for a misplaced program. Works with one drive or two. Fast, easy operation. This program is a must for everyone!

ONLY $19.95

THE XXXXXXXXXX

X-RATED GRAPHICS LIBRARY

Your Print Show May Never Be The Same!

X-Rated Graphics guaranteed to spice up your special letterheads, greeting cards, signs and banners! Everything from mild to Look Out Nelly! 60 Erotic additions to heat up your print shop graphics library, plus 5 ribald Screen Magic additions!

Print Shop is a trademark of Broderbund.

$24.95

GRAPHICS & GAME DISK

X-Rated adventure like you have never seen before. Complete with graphic simulations.

Plus: X-Rated Cartoons

$24.95

HAVE WE GOT A MESSAGE . . . FOR YOU!

Message . . . is a unique graphics integration package which allows you to continuously display hiresolution and multicolor files. Up to 12 files* may be stored in memory and displayed from 1 to 59 seconds each.

Message . . . can use Print Shop 'Screen Magic' files, Flexidraw files, Doodle!, Koala Painter, and more! **Message . . .** even comes with a 'Screen Maker' program to create your own message files!

Use **Message . . .** for advertising displays, titles for home videos, art shows, etc. . . . **Message . . .** even plays background music to accompany displays and you can create your own music files with the 'Music Maker' program.

Also included are 'Graphic Aids' utilities for conversion of different file types, including conversion of Koala Painter files to Doodle! or Print Shop!

The price for all this? Just $19.95 including shipping and handling

*Actual number of files dependent on file complexity.

MAGNUM LOAD

Programed by Jim Drew

MAGNUM LOAD is a new replacement KERNAL (operating system) ROM chip for your Commodor 65 or 128 computer that will load and verify programs up to 6 times faster than before. The tape routines have been removed from the old chip and in their place have been put a high-speed loader, high-speed verify, and disk driver no-head-rattle routine. Unlike the older cartridge fast loaders, no ports are tied up at the rear of the computer, the screen is not blanked during loading and there is no wear-and-tear on the expansion port. For maximum convenience and performance, the chip is installed directly in the circuit board. Generally a socket has already been provided to make the operation easy, but occasionally some soldering may be required. Now you can give your 1541 disk drive "1571 speed."

Rather than give you more exagerated claims about how many times faster our ROM chip is compared to the slower cartridge versions, a comparison chart is supplied listing MEASURED loading times.

Program	Star-Dos	Reg. Load	Mach 5	Fast Load	MAGNUM LOAD
Pitstop II	?	144 sec.	43 sec.	41 sec.	**31 sec.**
Music Shop	?	105 sec.	105 sec.*	105*	**21 sec.**
Hitchhiker's Guide to the Galaxy	?	70 sec.	70 sec.*	N.G.**	**68 sec.**
On-field Football	?	149 sec.	66 sec.	63 sec.	**56 sec.**
EASY FINANCE I	?	58 sec.	13 sec.	13 sec.	**11 sec.**

$24.95 For 1541 or MSD Version

$39.95 for Combo Version

*Will not fast load - defaulted back to regular load

**Failed to load at all

D-CODER

- Translates any machine language program into easy-to-ready English descriptions with complete explanations of each command.
- Makes complete notations of all important memory locations accessed by the program (SID, VIC, MOS, KERNAL, etc.)
- Gives you three ways of accessing programs:
  1. **Will read and list programs from DISK**
  2. **Will read and list programs from MEMORY**
  3. **Direct user input (from magazines, etc.)**
- Can be used to locate and examine any machine language program's protection routines!
- Can be used to easily break apart machine language programs for study and examination!
- Printer option for complete hard copy listings!

You no longer need to be an EGGHEAD to read Machine Language. **$19.95**

N-CODER

THE PERFECT COMPANION PROGRAM TO D-CODER!

Allows you to easily make changes in machine language programs . . . right on the disk!

- Rewrite ability allows code to be altered and then rewritten directly to the disk!
- Features sector-by-sector scrolling assembly language display of machine language programs!
- Notation of ASCII text equivalents for easy spotting of embedded text strings!
- Handy reference display of all assembly language commands and their ML numerical equivalents!
- Byte splitter for easy splitting of decimal addresses into low byte-high byte format!

$19.95

SOFTWARE PROTECTION HANDBOOK
Third Edition! Now Available!

If you're **tired** of being harassed by **protected software** and too many **copy** programs, then this is the book for you! This 224 page manual covers the gamut from legalities to protection methods to step-by-step back up procedures. Now you can learn both how to **protect and unprotect** software! The techniques covered include copying cartridges to tape or disk, tape protection, and disk protection. Disk protection covers error numbers 20, 21, 22, 23, 27 and 29 **plus** single track formatting, header modification, header swapping, half track reading and writing, reading and modified bit densities, formatting illegal track/sectors, sync writing and **more!** The Third edition **explains**, tells how to **detect** and how to **write** them with included software.

C-64 Book Only ..... **$19.95** US

Book & Disk of all Programs ..... **$29.96** US

This manual does not condone piracy *Shipping: $2.00

'TRACK TRAP' The 1541 Disk Expander!
• Supplement to the Software Protection Handbook •

The most unusual and innovative protection analysis tool for the Commodore yet! — **Not For Beginners** — This system expands your 1541 drive giving capability otherwise only possible for **professional** disk duplication equipment. Now you can create or analyze exotic forms of disk protection. **'D.O.S. Kings' Take Note!'** — Entire tracks of data can be read and written without regard to 'standard' sync and format. You are not longer limited to sector by sector searches. Whole track readouts reveal hidden data even when all or most of the sectors have been erased. Uncovers and writes data under errors, pulse coded sync or data, hidden data and access codes, multiple track densities and more! This supplemental manual covers the complete implementation of the track trap system including necessary software and hardware documentation.

Track Trap disk expanded manual ..... **$9.95** US

Top Secret Stuff I and Top Secret Stuff II

Programed by Jim Drew

Are both collections of 20 programs per diskette (that works out to about $1.00 per program!) that help you explore and enhance your Commodore 64 and/or 128 and 1541 disk drive. Now you can unlock many secrets formerly known only to top machine language programmers by using these sophisticated "tools." If you have ever been curious about the inner workings of your computer system, now is your chance to dig in and find answers with the help of these programs. These collections of programs have gotten rave reviews from actual users, and we are sure that you, too, will be pleased.

The programs include on each diskette are listed below

TOP SECRET STUFF I

The Dock (view/repair disk contents)
Sync Checker (diskette)
Imbedded Track Number Creator
Disk Manipulation System
3 Minute Copy (backup program)
Diskette Matcher (compare sectors)
Unscratch A File (recover file)
View BAM (block allocation map)
1541 Read/Write Test
½ Track Reader
Header Reader (display disk header)
Sync Maker
Device Number Change (disk drive)
Electronic Arts Backup
Drive Mon (disk drive m/1 monitor)
Diskette File Log (start-end address)
Write-Protect Sensor Test
Repair A Track (recover data)
Fast Format (10 seconds)
½ Track Formatter

$19.95

TOP SECRET STUFF II

RAM Test (test Computer RAM)
Copy $A000-$FFFF (under ROMS)
Display G.C.R. (All sector data)
Un-Write Protect (diskette)
Unnew Program
Wedge - $8000
Smooth Scroll (messages up screen)
Koala Dump (koala pad screen dump)
Disk Manipulation System
Disk Eraser (20 second clean wipe)
Split Screen (TWO screen colors)
Disk Protection System (stops copies)
Write Protect (diskette)
Boot Maker (autobook BASIC programs)
Wedge - $C000
Diskmatcher II (high speed version)
No Drive Rattle (on reading errors)
3 Times Disk Drive Head Speed
Monitor Test (check video monitor)

$19.95

WAR GAMES AUTODIALER

1. **Auto Dial** will automatically dial a set of numbers you choose.
2. **Review Numbers** will review numbers that were answered by a computer.
3. **Save Numbers** will save numbers where a computer answered.
4. **Hardcopy of Numbers** will print out list of numbers where a computer answered.
5. **LOAD Numbers** will load in numbers to continue where it left off.
6. **Continue** will pick up dialing where it was interrupted.

$29.95

BBS

- 300/1200 Band
- Remote access for sysop
- 2 levels of security for up and down load
- 7 rooms (read and write) with 4 security levels
- Secret highest level
- Open chalk board
- Auto message cycling
- Printer option

Plus the only BBS with all three (3) proticals X modem, new printer and midwest term, so anyone can up/down load.

Don't be fooled by cheap imitations. This is the most comprehensive system available anywhere. Now at a new low price.

$39.95

Enclose Cashiers Check, Money Order or Personal Check. Allow 14 days for delivery. 2 to 7 days for phone orders. Canada orders must be in U.S. Dollars. VISA — MASTER CARD — C.O.D.

Programs for C-64 $2.00 S & H on all orders

Software Submissions Invited

VISA

MasterCard

MegaSoft Limited

P.O. Box 1080, Battle Ground, Washington 98604

Phone 800-541-1541 • BBS 206-687-5205. After Hours Computer to Computer Ordering.

The Sound of C-128 Music

Now, with the C-128's Basic 7.0, anyone can take full advantage of the sensational SID chip. Your C-128 can become a one-man band in no time.

By MATTHEW STERN

The Commodore 128 shares the C-64's magnificent sound and music capabilities. However, with the C-128 you can use them more quickly, more easily and with less chance for error.

Both the C-64 and C-128 contain the sound interface device, or SID, chip. This sophisticated three-voice synthesizer is capable of creating three-part harmony, a wide variety of sound effects and even synthesized human speech.

Unfortunately, the Basic 2.0 programming language used in the Commodore 64 has no special commands for using the SID chip. Sounds must be programmed by Poking values into each memory location. This makes programming sound and music on the Commodore 64 a cumbersome task.

In the C-128, in C-128 mode, the SID chip uses the extended Basic 7.0, which adds six new commands exclusively for controlling this chip. As you will soon see, these commands make it far easier for you to create sophisticated music and sound effects for your programs.

To begin, we'll take a look at how sound and music is created by the SID chip, and then how you can use Basic 7.0 to turn these sounds into the music or effects you want.

Making Sounds with Waves

Sounds are created by vibrations. For example, to make music on a guitar, you pluck its strings, causing them to vibrate. Your Commodore computer produces sound with electrical waves. The pitch of the sound is determined by the *frequency*, or speed, that the waves move, or *oscillate*. The faster the frequency, the higher the pitch.

The type of sound is determined by the shape of the wave, called the

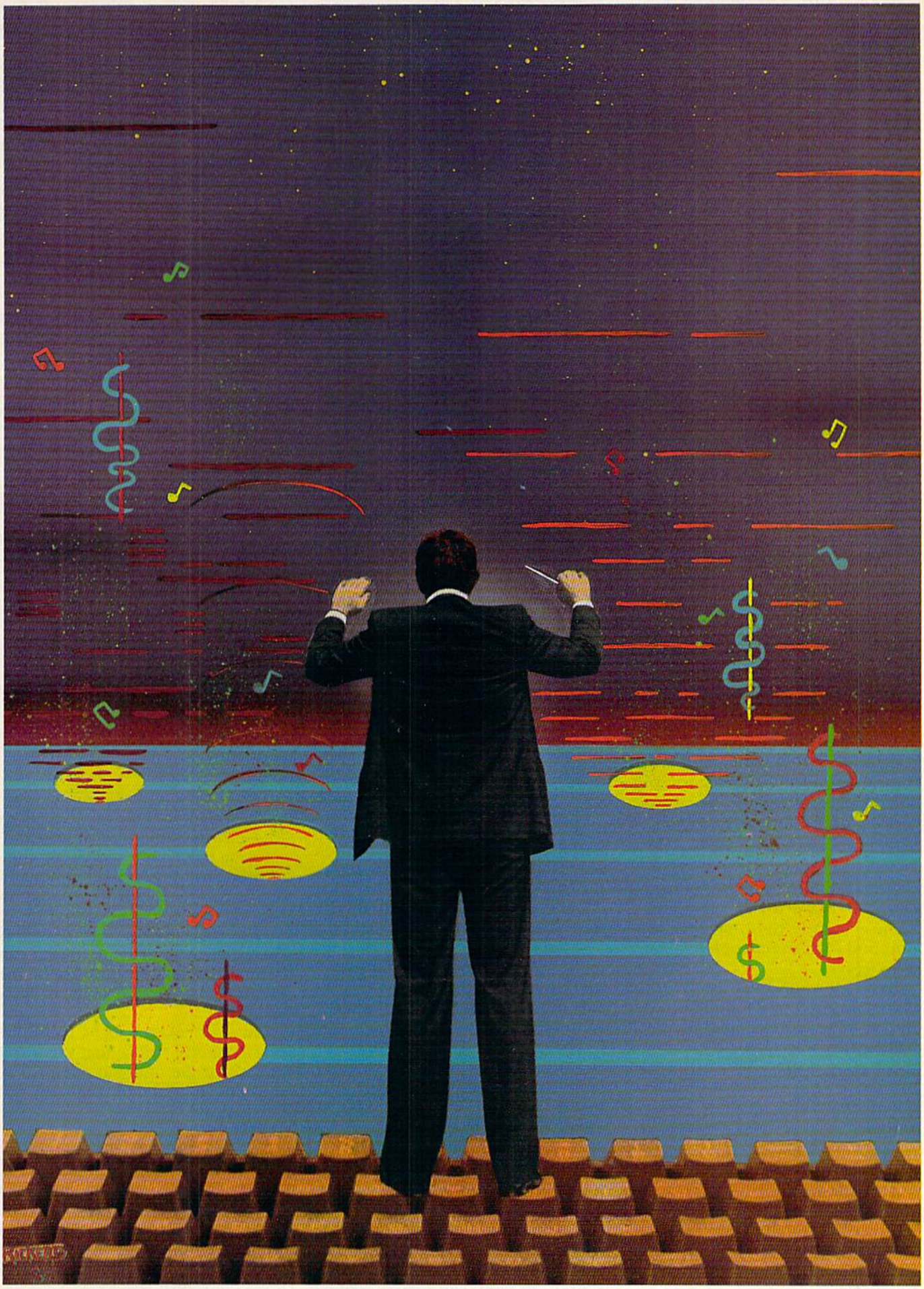


Illustration by David Rickerd

waveform. When the waveform is changed, so, too, is the type of sound. The Commodore SID chip creates four types of waveforms: triangle, sawtooth, pulse and noise.

The sound can also be altered by changing the volume patterns of each of the waves. Each sound goes through four volume changes. The first phase carries the sound from the lowest to the highest volume. This is called the *attack rate*. From the highest volume, the sound decreases to a middle level. This rate of decrease is called *decay*. *Sustain* is the middle volume in which the note is played. The note then decreases from the middle volume to zero at the rate of *release*. The four volume controls—attack, decay, sustain and release—are called the *ADSR registers*.

You create and control sounds on the SID chip by inserting specific values into the appropriate memory locations, or registers. With Commodore 64 Basic 2.0, you have to insert numbers into each register with Poke commands. Basic 7.0 does all that extra work for you.

No More Poking Around

Volume is represented by the SID chip with a value from 0 to 15, with 0 as no volume and 15 as the loudest. To control volume in Basic 2.0, you have to Poke it directly into the volume control register, like this:

```
POKE 54276,15
```

Basic 7.0's VOL command Pokes the value into the register for you. The command shown below performs the same function as the above command.

```
VOL 15
```

However, with the VOL command you don't have to worry about remembering the right memory location, and you can find potential bugs a lot easier.

Basic 7.0 commands also perform tasks that couldn't be done directly in Basic 2.0. For example, Basic 2.0 has no easy way to set the *tempo*, or speed, of your song. Basic 7.0 lets you use the Tempo command, which is entered like this:

```
TEMPO n
```

(n is a value from 0 to 255, with 255 being the fastest tempo.)

The advantages of Basic 7.0 become even more apparent when you try to create sounds. For example, if you wanted to play a middle C in Basic 2.0, you had to program the following:

```
5 FORL=54272TO54296:POKEL,Ø:
  NEXT:REM CLEARS REGISTERS
1Ø POKE54296,15:REM SETS THE
  VOLUME AT HIGHEST RATE
2Ø POKE54277,16:POKE54278,24
  8:REM SETS ADSR
25 POKE54273,16:POKE54272,19
  5:REM SETS FREQUENCY
3Ø POKE54276,17:REM SETS THE
  WAVEFORM
35 FORN=1TO25Ø:NEXT:REM THIS
  LOOP DETERMINES DURATION
4Ø POKE54276,16:REM TURN OFF
  NOTE
```

A real pain, isn't it? But Basic 7.0 has a command that does all that programming with a single command, called Sound. Type the following line and press the return key.

```
SOUND1,4291,25
```

As you can hear, it created a sound at the same pitch as the program above, but with six fewer lines.

The Sound Command

Three numbers were used in the Sound command shown above. The first value, 1, selects one of the three voices.

The second value, 4291, is the frequency. It is the same frequency as was Poked into the Basic 2.0 program, except you can express it as one value (instead of two) from 0 to 65535.

The third number, 25, is the duration of the note, which is measured in 60ths of a second. This note played for 25/60ths of a second, which is about the same duration as the For...Next loop in line 35 in the Basic 2.0 program.

What about the values for volume, ADSR and waveform? You needn't enter those values to play the sound. Basic 7.0 has certain set values, called *defaults*, which, if you don't specify any others, are used automatically. You can change these default settings to fit your needs. The Sound command has additional parameters you can use to create more interesting sound effects.

The complete Sound command is shown below. The parameters in boldface are required to use the command. The parameters in regular type are optional.

```
SOUND v, f, dur, dir, min, sv, wf, pw
```

You are already familiar with the first three: v is for voice; f is for frequency; and dur is for duration.

The middle three parameters—dir, min and sv—affect the *sweep*, which changes the pitch during the sound, so you can make wailing sounds like a siren, rising sounds like a rocket taking off or falling sounds like a bomb dropping.

The dir value controls the direction of the sweep: 0 makes the frequency increase; 1 makes the frequency decrease; and 2 oscillates the frequency up and down. The min parameter is the minimum frequency (from 0 to 65535) used in the sweep; sv is the step value that the frequency changes. If you enter 0 for direction and 10 for step value, then the frequency is increased by 10 each step. The greater the steps, the faster the pitch changes.

The last two parameters, wf and pw, let you set the waveform. For wf, you enter a number from 0 to 3, representing the waveform.

```
0 = triangle
1 = sawtooth
2 = pulse
3 = noise
```

If you enter pulse as a waveform, you need to enter the width of the pulse wave under pw.

As an example of how the Sound command works, type in the program and run it:

```
1Ø FORN=1TO42ØØØSTEP5Ø
2Ø VOL(15-INT(N/35ØØ))
3Ø SOUND1,N,1,Ø,Ø,Ø,3,Ø
4Ø NEXT
5Ø VOL6
6Ø SOUND1,42ØØØ,42Ø,1,Ø,75,Ø
  ,Ø
7Ø FORP=1TO25Ø:NEXT
8Ø VOL15
9Ø SOUND1,1Ø24,6Ø,Ø,Ø,Ø,3,Ø
```

The first part of the program, lines 10–40, shows how you can use variables in the Sound and VOL commands. The loop in lines 10 and 40 increases the frequency played in line 30.

Line 20 decreases the volume as the frequency increases. You can change the volume throughout the program, as was also done in lines 50 and 80.

Line 70 makes a slight pause between sounds. Notice that when you use any of the optional parameters, you must enter 0s for the ones you don't use.

The Play Command

With Basic 7.0's Play command, you don't need to Poke values into memory locations. You just enter the notes you want played. If you can read music, you can play a song. For example, type the following line and press the return key.

PLAY"C D E F G A B"

You don't need to set the waveform, ADSR, volume or even the voice, duration and octave of the notes. Those are all defaults. Of course, you want more control over what you want played, so the Play command lets you enter additional control characters.

To finish our C scale, for example, you want to play the C in the next octave up. To do this, you enter an element—O followed by a number from 0 to 6, representing the octave.

PLAY"C D E F G A B O5 C"

Basic 7.0 also has a series of elements to represent the length of the note:

W—whole note
H—half note
Q—quarter note
I—eighth note
S—sixteenth note
.—dotted note

Again, the duration elements precede the note played. All of the notes after the duration element are played at the same length until another duration code appears. Enter this line:

PLAY"O4 QC D E F G A B W O5 C"

Rests are played by entering an R. Like a note, you can precede it with any of the duration elements.

Of course, Basic 7.0 lets you play sharps and flats. Sharps are played by preceding the note with a number sign (#), and flat notes are preceded with a dollar sign ($). For example, this line plays a D scale:

PLAY"O4 D E #F G A B #C O5 D"

The Play command has four other control characters for playing music. All of these controls are represented by a letter followed by a number.

Voice (V) lets you select which of the three voices you want to play. For harmony, you can use three voices in a single Play command. Envelope (T) lets you select from ten preset instrument sounds, numbered from 0 to 9. You can play one part of your song with a flute by preceding the notes with T4, and you can play another part with a trumpet by using T8. Volume (U) lets you change the volume during a song. Like the VOL command, it uses a value from 0 to 15. Filter (X) lets you turn the sound chip's filter on (with a 1) or off (with a 0) to change sound quality. You can further define the filter settings with the Filter command (which I'll discuss later).

The complete Play command looks like this:

PLAY"Vn On Tn Un Xn notes"

The notes include rests, sharps and flats, and note-duration characters. Since all of these elements are enclosed in quotes, you can use them as a character string. This allows you to use variables and string functions with the Play command.

As an example of what you can do, run the following program:

```
1 REM ODE TO JOY-BEETHOVEN
5 TEMPO1Ø
1Ø PLAY"V1 T7 U15 O5 HE QF Q
   G QG QF QE QD QC QC QD QE
   QE QD HD"
2Ø PLAY"HE QF QG QG QF QE QD
   QC QC QD QE QD QC HC M"
3Ø PLAY"U5 T4 QD QD QE QC QD
   IE IF QE QC QD IE IF QE Q
   D QC QD HG M"
4Ø PLAY"U15 T7 HE QF QG QG Q
   F QE QD QC QC QD QE .HD Q
   C WC"
```

Envelope and Filter

The other two sound-control commands in Basic 7.0 let you further define your sound's tone and quality.

The Envelope command controls the shape and the ADSR of the waveform, so you can create a variety of sounds. You can select one of ten preset sounds, which can be further defined by changing the ADSR, waveform and pulse width.

The Envelope command is entered as follows, with the required parameters in boldface, the optional ones in regular type:

ENVELOPE **e**,a,d,s,r,wf,p

Circle 418 on Reader Service card.

TEAM-MATE: THE SINGLE SOLUTION TO THE CLUTTER THAT CAN TIE UP YOUR DESK

When you buy TEAM-MATE, you receive an integrated software system — word processing, file management, spreadsheet and graphics — for the same price you would normally pay for one program. The beauty of integration is the ability to go from one program to another instantly with no loss of screen information. No more lengthy program loads with various disks. No time lost in creating data transfer files. Now you can concentrate on solving problems again and again.

With all the information available simultaneously, you can view the spreadsheet while analyzing it in the word processor. You have total freedom to design reports and forms, which will use all or part of the data stored in the file manager. And because the print preview mode works with the integrated data, you can view where this information will be printed on the form, letter, or label.

So if you need only one great piece of software, buy TEAM-MATE. It's like buying one piece of software and getting three others free. For the C-64™ C-128™ and Atari™

For more information on where to buy Tri Micro software 714-832-6707

TRI MICRO

14072 Stratton Way, Santa Ana, CA 92705

Circle 440 on Reader Service card

FREE SHIPPING

SOFTWARE DIMENSIONS

- Free UPS ground shipping. For next day air service add $7.
- VISA & MASTERCARD
- For C.O.D.'s add 2%—minimal service charge is $3.
- Personal and company checks will delay shipping 2 weeks.
- Company and school administration purchase orders accepted upon approval.
- Prices and availabilities subject to change without notice.
- We do not guarantee machine compatibility.

COMMODORE

SPECIALS

Bank Street Writer	$21	Karateka	$18
Fast Load	$24	Superbase 64	$48

BUSINESS

Back to Basics GL	$ 66.50
Back to Basics GL, AR, AP	136.50

EDUCATION

Adventures w/Fractions	$13.96
Basket Bounce	20.96
Blazing Paddles	24.46
Charlie Brown's ABC's	20.96
Kid Stuff	14.00
Kids on Keys	18.86
Kidwriter	18.86
Loadstar Vol #5-#10	6.96
Mastertype	27.96
Rhymes & Riddles	18.86
SAT Algebra	27.96
SAT Practice Tests	13.96
SAT Vocabulary	27.96
Science	14.00
Snooper Troops	23.06
Spell	34.96
Spellagraph	27.96
Spellakazam	20.96
Spelling Bee	13.96
The Body Transparent	31.46
Word Challenger	13.96

GAMES

Cutthroats	27.96
Deadline	34.96
Donald Duck's Playground	27.96
Enchanter	27.96
Expedition Amazon	24.46
F-15 Strike Eagle	24.46
Flight Simulator II	34.96
Ghostbusters	24.46
Hard Hat Mack	24.50
Hitchhikers Guide to the Galaxy	27.96
Impossible Mission	24.46
Infidel	31.46
Kennedy Approach	24.46
Loderunner	24.46
Mickey's Space Adventure	27.96
One-on-One	28.00
Pinball Construction Set	28.00
Sorcerer	31.46
Spy Fox	28.00
Stellar 7	20.96
Suspect	31.46
Tycoon	41.96
Ultima II	41.96
Ultima III	41.96
Winnie the Pooh	27.96
Wishbringer	27.96
Witness	27.96
Zork I	27.96
Zork II	31.46
Zork III	31.46

HOME

Bank Street Writer	$34.96
Homeword	34.96
PaperClip	83.96
Printshop Graphics Library	17.46
Printshop Paper Pack	13.96
Professional Word Processor	62.96
The Home Accountant	55.96
The Print Shop	31.46

PROGRAMMING LANGUAGE

Logo	51.76
Oxford Pascal	41.96
Simon's Basic	24.46

UTILITIES

Copy II 64	27.96
Fastload	28.00
Magic Paintbrush	24.46
Picture Builder	20.96
Shapes & Fonts	14.00

IF YOU DON'T SEE THE TITLE YOU WANT, CALL US
Call Toll Free to place your order

1-800-826-2447 Calls originating outside Colorado

1-800-222-0697 Calls originating inside Colorado

PACIFIC TIME: (Mon.–Sat. 6 am–8 pm), (Sun. 11 am–4 pm)

7830-A North Academy Blvd., Colorado Springs, CO 80918

E is one of the ten preset sounds used in the Play commands; a, d, s and r parameters are the attack, decay, sustain and release rates. Each is represented with a value from 0 to 15, with 0 as the lowest level or rate and 15 as the highest. For wf, you enter a number representing the type of waveform: 0 for triangle, 1 for sawtooth, 2 for pulse, 3 for waveform.

If you enter 4, you are using ring modulation, a special form of harmonics that uses the pitch in one voice to modify the tone in another. If you use the pulse waveform, you need to enter the pulse width under p as a value from 0 to 4095.

The Filter command lets you refine your sounds with the SID chip's filter. You can filter through some frequencies while deadening others.

By cutting off the high frequencies with the low-pass filter, you create a muffled sound. The band-pass, or mid-range, filter allows only a narrow band of frequencies to pass through, creating a nasal sound. The high-pass filter permits only high frequencies to pass through, creating a tinny sound.

You can also adjust the resonance, which determines how much the filters affect the sound. The higher the resonance, the sharper the sound.

The Filter command is entered in this way:

```
FILTER cf,lp,bp,hp,rs
```

CF is the cutoff frequency, represented by a value from 0 to 2047. The lp, bp and hp parameters are the low-pass, high-pass and band-pass filters, respectively. To turn them on you enter a 1 in those positions; to turn them off you enter a 0. You can turn on more than one filter. RS is the resonance, which is entered as a value from 0 to 15, with 15 as the greatest resonance. When you use this command, enter values for all five parameters.

For More Information

This article is meant to be a brief introduction to the SID chip and the C-128's Basic 7.0 commands used to operate it. If you want more information, read the *Commodore 128 Personal Computer System Guide* (included with your computer), *Commodore 128 Programmer's Reference Guide* and *Complete Course in Basic* (both available this fall). R

Address all author correspondence to Matthew Stern, 6434 Amigo Ave., Reseda, CA, 91335-6001.

MOVING?

SUBSCRIPTION PROBLEM?

Get help with your subscription by calling our new toll free number:

1-800-645-9559*

between 9 a.m. and 5 p.m. EST, Monday–Friday.

If possible, please have your mailing label in front of you as well as your cancelled check or credit card statement if you are having problems with payment

If moving, please give both your old address and new address.

* New York State residents call 1-800-732-9119.

WCCA PRESENTS

THE COMMODORE SHOW

FEBRUARY 8th & 9th

CATHEDRAL HILL HOTEL

CALL 800-227-4730 for hotel reservations

- *100+ VENDOR BOOTHS & DISPLAYS*
- *NATIONAL COMMODORE SPEAKERS*
- *SHOW SPECIALS & DISCOUNTS*
- *SEE THE LATEST INNOVATIONS IN HARDWARE/ SOFTWARE TECHNOLOGY FOR THE COMMODORE MARKET*

The only West Coast exhibition and conference focusing exclusively on the AMIGA, Commodore 128 PC and C-64 marketplace.

REGISTRATION FEES: ONE DAY $10.00 TWO DAY $15.00

FOR MORE INFORMATION AND DETAILS CONTACT:

WEST COAST COMMODORE ASSOCIATION, INC.
P.O.BOX 210638
SAN FRANCISCO, CALIFORNIA 94121
(415)982-1040 BETWEEN 8AM-5PM PST

Kingswood Software Associates

Cordially invites you to celebrate with us the

Texas Sesquicentennial
(1836-1986)

Use your Commodore 64 or 128 to see the history of the Lone Star State unfold in Music and Pictures. Experience the heritage of the early settlers thru this LIMITED EDITION disk. This will truly become a Collector's Item. Each disk (1541 or 1571)

Only $19.95

Other titles include Fight Songs, Sacred Songs and Hymns, Classics of Bach, and others.

Announcing

R E X™

MACRO

ASSEMBLER DEVELOPMENT SYSTEM

NEW FOR Commodore C=128™

Also Version for B128™

Full featured Macro Assembler with Conditionals, Cross References. Supports LIBRARIES. Single files of 64K. B-version automatically uses all 256K if installed. Excellent Built-in Editor. Unlimited support & upgrades (for nominal charge). Specify Version (B or C) & Drive (8050, 4040, 1541, 1571).

Only $49.95

Ck/MO only. Add $2.00 P&H. Texas residents add Sales Tax. Allow 2 wks. for personal Ck's.

C=128, B-128 Reg. TM Commodore Business Machines REX Reg. TM Kingswood Software Associates.

Kingswood Software Associates
246 Bancroft Drive
Garland, TX 75040

Get On-Line! Discover the World of Telecommunications

By PEGGY HERRINGTON

With a Commodore computer and modem, you can bring the exciting world of telecommunications to your fingertips. This article introduces you to that world, familiarizes you with its terminology, reviews Commodore's modems and provides a list of the major commercial networks available.

It used to be that on-line enthusiasts were professionals in the computer industry, but, now, hundreds of thousands of users have discovered the delights of telecommunicating. On evenings and weekends, they're just people having fun, chatting or gathering information and programs—people just like you.

Being on-line means that you're connected by phone to another computer. In addition to a computer with monitor or TV and a disk drive, you need terminal software, a modem and, of course, an operating telephone—preferably without call-waiting service, because the tone that is produced by an incoming call will disconnect you from a BBS or commercial network. (If you have call-waiting and live in an Equal Access area, ask your local telephone company for the number to dial to temporarily disable it.)

Terminal programs disable your computer's ability to compute. Working with one is much like using a word processor—the primary difference being that what you type is sent to the modem instead of a printer.

A modem is a peripheral device that connects your telephone and computer—and, therefore, you—to the outside world. It plugs into the RS-232 user port and is so named because it MODulates the computer's digital bit streams (zeros and ones) into the analog signals that phone lines carry, and DEModulates them back again.

Once on-line, you can participate in several activities, most of which fall into one of the following categories.

Gathering facts and information

Extensive on-line databases contain current as well as reference material. You can download (receive into your computer) current news, sports and stock market reports, or get information from encyclopedias, old newspapers and government publications.

Upon being received by your computer, all this information can be quickly transferred to disk, and you can sign off the host computer (important because networks charge by the minute) and study your findings at your leisure. Information on subjects ranging from personal computing to hobby and professional topics is often enhanced by messages from other users, to whom you can leave comments or questions. Through The Electronic University, for example, you can even earn a college degree without leaving home.

Downloading computer programs

One of the best reasons to get involved in telecommunications is the huge library of public domain programs you can download and call your own, usually at no charge beyond network connect-time fees. The entire Commodore Public Domain Series, which is available in retail outlets, for instance, is now available on both CompuServe and QuantumLink. Even that collection, however, is dwarfed by the many quality programs contributed by users through electronic bulletin boards, networks and user's groups during the past two or three years.

Public domain programs are never copy-protected. You can study their structure and programming techniques and even personalize and enhance them. They are devoted to every subject you can imagine, in all programming languages available on Commodore computers.

80 COLUMNS ON ANY COMPOSITE MONITOR

Lonnie Raymond

QUALITY AND DEPENDABILITY
(and warranteed for LIFE)

CABLE WARE

KN-128-1	80 Column monochrome cable (RGB) for C-128	$14.95
KN-130-5-5	Composite monitor cable (5 pin din—5 ft.)	$12.95
KN-135-5-8	Composite monitor cable (8 pin din—5 ft.)	$12.95
KN-140-6	Commodore Serial Interface cable (6 ft.)	$ 7.95
KN-140-9	Commodore Serial Interface cable (9 ft.)	$ 9.95
KN-200-5	Standard RGB/RGB monitor cable (9 pin D-sub to 9 pin D-sub wired straight through (3 ft.)	$19.95
KN-250-1-10	Standard RS-232 Interface cable (25 pin D-sub to 25 pin D-sub Male to Male straight (10 ft.)	$29.95

* Call for complete list of cables for all computers
* All cables can be custom made to your specifications
* Each cable is HANDMADE and INDIVIDUALLY TESTED
* Hundreds of dealers coast to coast
* Call today for selected dealer near you

DISK WARE

Single Sided/Double Density
W/Tyvec Sleeves, Write Protects
Blank Labels, and the KNIGHT Warranty
. . . . . $8.99 per ten pack

Double Sided/Double Density
W/Tyvec Sleeves, Write Protects,
Blank Labels, and the KNIGHT
Warranty . . . . . $9.99 per ten pack

KNIGHT WARRANTY
(Lifetime)

KNIGHT SOFTWARE LTD. will replace any defective KNIGHT product for any reason, for LIFE. That's Right! For LIFE!!!! If at any time during the life of your KNIGHT product, it fails to perform due to normal wear or due to any accident, KNIGHT SOFTWARE LTD. will replace the product free. Just send us the remaining pieces of the product, the warranty card, and the sales slip from place of purchase and product will be promptly replaced.

KNIGHT QUALITY AND DEPENDABILITY FOR LIFE

"WHEN LOOKING FOR *QUALITY* AND *DEPENDABILITY*, LOOK TO KNIGHT SOFTWARE LTD. . . "

KNIGHT

Knight Software LTD.
Central Village, CT
(203) 564-4982 (in CT)
(800) 531-5334

Have fun!

"Talk"—in real time, by typing on your computer—with people from all over the Western world. The bulk of them are from North America, but I've chatted on-line with users in England, France and the Netherlands. On-line conversation comes in two modes: public and private. In the former, whatever you type appears on the screen of whoever happens to be in the same area (sometimes called channel, or room), while, in the latter, what you type appears only to whom you have directed it.

Messages (text saved by the host system) work the same way—public or private—and can be made available to everyone who's interested, forwarded to someone in a different area or saved for a specific person until he or she logs onto the system at another time. A command of English and typing skills are valuable assets, because telecommunicating offers advantages to the quick and literate (physical barriers, such as age and appearance, are broken down).

Forums, clubs and special-interest groups (SIGs) help users find others who share their interests. They also make the possibilities for a network like CompuServe, with its 250,000 subscribers and dozens of SIGs (each with its own conference, or talk area) almost inexhaustible.

For all kinds of computers, standard telecommunications fare has long included SIGs, complete with programs to download, SYSOPs (system operators) to help you with computer-related problems and even on-line programming lessons.

As the user base has broadened, so, too, have SIG offerings. Many SIGs now offer a variety of hobby and professional areas, such as medicine, religion, music and literature. Also, there's the famous CB simulator, where fantasy is the order of the moment—an area on CompuServe so popular it inspired the talk-oriented network, PeopleLink and others.

Playing on-line games with people across the country as easily as across town is fun. But don't be fooled: The colorful graphics on your screen aren't coming from the host system; they are actually loaded from disks sent to you when you join a service like PlayNet or QuantumLink.

Viewtron, the first national network to offer on-line graphics to Commodore telecomputers, uses NAPLPS technology (North American Presentation Level Protocol Syntax) to send graphics over telephone lines, a method similar to ASCII (the American Standard Code for Information Interchange), which standardized numerical values for letters, numbers and punctuation.

Purchase merchandise and services

You can buy almost anything on-line, including software, computers and peripheral devices, televisions, appliances, radios, stereos, telephones, clothing, musical instruments, record albums and sheet music, books, magazines, furniture and more. You can get astrological or weather forecasts, study commercial airline schedules or file your own flight plan. You can even pay your bills with on-line banking.

With all this—and much, much more—as readily available to people in the boondocks as those living in major metropolitan areas, it's no wonder many analysts see telecommunications as a solution to the declining interest in personal computing.

Instead of encouraging tunnel vision and inhibiting human interaction (as some have accused the computer of doing), the computer, through the marvels of telecommunications, has become a gateway to the outside world. It can broaden intellectual horizons while providing the means for relationships between people who otherwise may have never met.

Some analysts see the telecommunications-equipped computer work station as the emergence of the long-heralded home information and control center. This electronic resource is predicted to coordinate a family's shopping, entertainment, communications and financial management within the community in which they live.

Telecommunications Hosts

In general, there are three outlets for telecommunications. The first involves connecting your C-64 or C-128 to a commercial network. Many of these same principles are implemented when you log-on to a mainframe computer operated by a business or university.

The second outlet, which is much less complex in all respects, is connecting your computer to a friend's. With telephones and the proper equipment on each end, your computer can dial the phone number and let the two of you talk via the keyboard or exchange programs or text files. This is easiest to accomplish if you both use the same terminal program.

The third outlet is bulletin board systems (BBSs). There are thousands of privately operated BBSs across the country that you can access for the price of a long-distance phone call—or for nothing, if they're located in your local calling area. (User's groups and computer stores usually have BBS phone numbers.) These systems are hosted by personal computers of all kinds and have message and program libraries you can access.

Since computers communicate with ASCII for text, you can participate in message areas on all brands of host systems, not only Commodore, with just about any terminal program. However, to upload (send) or download (receive) programs and ensure accuracy of transmission, your terminal program must offer the same method of error-checking employed by the host computer. Commodore computers use a slight variant of ASCII (in which the values for upper- and lowercase letters are switched). This is accommodated by an error-checking method developed by Steve Punter.

When accessing a BBS hosted by a Commodore computer, the protocol most often in use will be Punter; nearly all other host systems use a set of rules or protocols know as Xmodem.

Commodore's Modems

Commodore Business Machines has produced four asynchronous, direct-connect modems, although only the two most recent models are now being manufactured.

1600 VICModem

Commodore's first modem, the 1600 VICModem, was introduced back in 1982 but is nonetheless entirely compatible with the C-64 and C-128. The software provided on tape with the 1600 VICModem is a "dumb" terminal for the VIC-20, meaning you can't upload or download files with it.

The 1600 itself is not capable of dialing a phone (you must do that yourself), nor will it answer an incoming call. It can only be used with a modular telephone that allows the dialing mechanism to remain within the system once you've dialed the number, removed the headset and manually plugged the phone cord into it. In other words,

Circle 461 on Reader Service card.

michaelsoft™
A COTTAGE INDUSTRY OF HOMESPUN SOFTWARE

MIKE KONSHAK
Introduces...

dfile 128™
designed specifically for
COMMODORE C-128 COMPUTER

Good reputations are well-earned. Time after time, their credibility must be upheld. Mike Konshak has done just that by creating **dFile 128** on the heels of his popular **Datafile** program, published in Run Magazine.

This is a program designed especially for the C128 taking advantage of the new BASIC 7.0 commands and additional memory.

Here are some of **dFile 128's** capabilities...

A FULL FEATURED DATABASE FOR:

- ☐ GENEALOGY STUDIES
- ☐ INVENTORIES
- ☐ MAILING LISTS
- ☐ FINANCIAL REPORTS
- ☐ SCIENTIFIC DATA ACQUISITION, CALCULATIONS

GENERAL RECORD KEEPING FOR HOME-OFFICE-EDUCATION.

- FAST MEMORY MANAGEMENT
- SINGLE OR MULTI-DISK DRIVES
- 80 COL RGB/40 COL MONITORS
- UNLIMITED FIELDS TO 255 CHRS
- MULTI-FIELD SEARCHES/SORTS
- 16 COL. REPORTS/4-UP LABLES
- UTILITY PGMS AVAILABLE

19.95

CHECK/MONEY ORDER
VISA & MASTERCARD ACCEPTED
COLORADO RESIDENTS ADD 3½%
FOREIGN ORDERS PLEASE ADD $2.00

Definition: michaelsoft 1) michael: another name for Mike, Miguel, Micky, and others. A person, just like you. 2) soft: like a baby's bottom, warm fuzzies, easy on the eyes and gentle on the mind.

dfile 64™
is a version for the C64 available for the same low price of 19.95

michaelsoft™
A COTTAGE INDUSTRY OF HOMESPUN SOFTWARE
4821 HARVEST COURT (303) 596-4243
COLORADO SPRINGS, CO 80917 USA

Circle 444 on Reader Service card.

DISCOUNT SOFTWARE
37 S. Broad Street, Fairborn, OH 45324

ORDERS ONLY: 1-800-282-0333
CUSTOMER SERVICE & OHIO ORDERS: 1-513-879-9699
Mon.-Fri. 10 a.m.-7 p.m.; Sat. 10-3 ET

ABBY'S SUPER SALE!

COMMODORE 128 & 1571 Disk Drive

BOTH FOR ONLY $509

ABBY'S TOP HITS

B/Graph	$29	Loderunner Rescue	$23	Master of the Lamps	CALL
CSM 1541 Disk Alignment	$39	Fast Hack'em	$33	Hacker	CALL
Mindwheel	$29	Mr. Nibble & MSD version	$34	Karate Champ	$24
Essex	$33	Mindprober	$22	Spy vs. Spy	$21
Brimstone	$33	Fontmaster	$19	Spy vs. Spy II	CALL
Super Bowl Sunday	$24	Fontmaster II	CALL	Star Rank Boxing	$25
Team Disk (for above)	$15	Alcazar: The Forgotten Fortress	CALL	S'More Basic Enhancement	$49
Micro League Baseball	$31	Countdown to Shutdown	CALL	Tsushima	$24
Team Disk (for above)	$16				
Bards Tale	$28				
Movie Maker (New Version)	$24				
Flight Simulator II (D or C)	$39				
Scenery Disks (for above)	ea. $16				
Western U.S. (Disks 1 6)	$79				

SOFTWARE ONLY — Prepaid orders over $50 receive free shipping via UPS in continental U.S. Please add $2 orders under $50. Hardware and all orders requiring shipment via U.S. Post Office are subject to additional freight charges. Add $5 for COD orders. VISA/MasterCard orders under $15 add $1 service charge. Ohio residents add 5.5% sales tax. Personal checks require a three-week waiting period. No waiting when paid by credit card, certified check or money order. All items subject to availability and price change. PLEASE CITE AD NUMBER WHEN ORDERING. WE CHECK FOR STOLEN VISA & MC.

AD #R-SP1

Circle 434 on Reader Service card.

IS IT POSSIBLE TO MAKE THE BEST ANY BETTER?!

The MW-350 is getting better with age because of these new additions:

- Standard 4K Buffer
- Special Software Modes
- Supports more printers

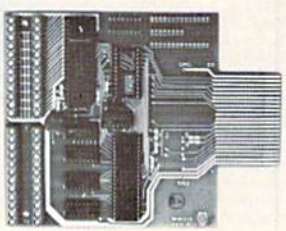
★ ★ ★ ★ ★ ★ ★ ★

And it still has:

- Built-in Self Test with Status Report
- Microprocessor controlled emulation of Commodore printers for compatability with popular software
- Optional Transparent Mode
- External switch selectable Commodore graphics mode for Epson, Star Micronics, C. Itoh Prowriter, Okidata, Seikosha, Banana, BMC, Panasonic, Mannesman-Talley, Think Jet & others.

NEW INTRODUCTORY SALE!
PRICE $89.00
OR ..... $79.00 with trade in of your old interface

Universal Input/Output Board for C-64 & C-128



- 16 Channel 8-bit A/D converter with 100 microsecond sampling time.
- 1 D/A output
- 16 high voltage/high current discrete output
- 1 EPROM socket
- Use multiple boards for additional channels up to 6 boards

MW-611 ..... $225.00

Dealer Inquiries invited

VISA MasterCard

Micro World Computers, Inc. (303) 987-9531
3333 W. Wadsworth Blvd. #C105
Lakewood, CO 80227

it is operable primarily with an old-fashioned modular desk phone.

However, on the 1600, all communications parameters are adjustable through software control, including a transmission or baud rate of up to 300 bps (bits per second). With appropriately upgraded terminal software (widely available both commercially and from the public domain), the 1600 will operate on all types of host systems and provide accurate program transfer in both directions.

1650 AutoModem

Commodore's second offering, the 1650 AutoModem, includes all the hardware features of the 1600 VICModem, plus a switch that lets you select full- or half-duplex and the ability to automatically dial and answer a telephone (the latter is a necessity for using it on a BBS).

It is designed to work with any type of modular telephone (including a Trimline). The incoming phone line is plugged into the modem, and a phone wire, included with the unit, connects the 1650 to the base of the phone, where the incoming line would normally be. A data/telephone switch allows the phone to remain within the system, regardless of whether or not the 1650 is in use.

Like the 1600, the 1650 is limited to a maximum of 300 baud, and both have a small red light that, when lit, indicates the presence of the carrier signal from the host system; it will go out if call-waiting service or some other interruption "dumps" you.

A Basic terminal program for the C-64, called Term 64, is provided with the 1650, again on tape. By modifying Term 64's program listing, you may store up to ten phone numbers, which can then be dialed automatically. The screen colors are changeable, there is no resident buffer in which to capture incoming data and you cannot send or receive program or text files.

1660 Modem/300

The 1600 VICModem was replaced by the more sophisticated 1650 AutoModem, which was, in turn, superseded by a third Commodore modem—the 1660 Modem/300. Like its predecessor, the 1660 operates at 300 baud and has automatic answer and dial capabilities, but can be used with Touch-Tone or rotary phones and features a built-in speaker that lets you hear the call being dialed or, more importantly, a recording or busy signal. It doesn't have a red indicator light.

Accompanying the 1660 is a disk containing HiggyTerm 64. This machine language terminal program can be used with other Commodore modems and offers 16 programmable function keys, memory for ten telephone numbers, an on-screen clock, changeable display colors and a 40K capture buffer, the contents of which can be printed or saved to disk.

There are no upload/download error-checking protocols incorporated in HiggyTerm. Although it is possible to capture a program file in sequential form with the buffer, the file must then be later translated back with a separate utility program, which is not provided. This method is error-prone and recommended only as an exercise in frustration.

1670 Modem/1200

Commodore's most recent addition, the 1670 Modem/1200, although not available for review at press time, promises to incorporate all features of the new 1660 Modem/300 and to handle data at the rate of 1200 bps—strikingly faster than any previous Commodore modem. This will substantially reduce the time required to download programs and information. Although most commercial networks increase connect-time charges for 1200 bps access, this increase will be offset by a savings on long-distance charges, since the transfer rates are so fast. One situation, however, won't be enhanced at 1200 bps and that's real-time conversation. For this, the 1670 can be switched on command to 300 bps.

Enhanced Terminal Software

The modem controls functions such as maximum transmission speed and automatic telephone answering/dialing. By and large, however, the terminal program determines what you can and cannot do on-line. All Commodore modems work with software from independent third-party developers, and, in the case of the earlier three modems, you'll need to obtain this additional software to transfer programs on-line.

Remember to match the error-checking protocol in your program with that used by the host system you plan to access (Punter for Commodore BBSs, Xmodem for others; for CompuServe, Xmodem with their "B" protocols).

When you're ready to upgrade your terminal software, here are some other important features to consider:

Compatibility. Software won't give a modem talents it doesn't possess. For instance, the 1600 VICModem won't dial a phone, although programs with auto-dial/auto-answer will work with it. Overall, software compatibility with Commodore modems isn't a problem. (It could be with other brands.)

Adjustable communication parameters. Duplex, parity, baud rate, word length and stop bits are software controllable on Commodore modems. Make sure the terminal pro-

Circle 446 on Reader Service card.

DIGITAL VISION

COMPUTEREYES™

VIDEO IMAGES ON YOUR COMPUTER!

Finally—an inexpensive way to capture real-world images on your computer's graphics display! COMPUTEREYES™ is an innovative slow-scan device that connects between any standard video source (video tape recorder, video camera, videodisk, etc.) and your computer. Under simple software control, a b/w image is acquired in less than six seconds. Unique multi-scan modes also provide realistic grey-scale images. Hundreds of applications!

Package includes interface module, complete easy-to-use software support on disk, owner's manual, and one year warranty all for $129.95 plus $4.00 S&H (USA).

Also available as a complete package including:
- COMPUTEREYES™
- Quality b/w video camera
- Connecting cable

for only $399.95 plus $9.00 S&H.

Demo disk available for $10.00 postpaid (refundable).

ONLY $129.95

See your dealer or order direct. Mass. residents add 5% sales tax. Mastercard, Visa accepted. To order, or for more information, write or call:

Available for:
- Apple II series
- Commodore 64/128
- Atari 800/800XL/65XE/130XE

DIGITAL VISION, INC.
14 Oak Street — Suite 2
Needham, MA 02192
(617) 444-9040, 449-7160

Circle 481 on Reader Service card

Learn to
PLAY GUITAR
IN ONE MONTH
or your money back!!

Learn to play the easy way with
EASY GUITAR

This fun program for your C-64 or C-128 is a revolutionary advancement in guitar instruction.

NO MORE COSTLY LESSONS
Why pay hundreds of dollars to a professional guitar instructor when EASY GUITAR will teach you what you really want to know for just **$29.95**.

INCREDIBLE RESULTS
You will be amazed at how quick and easy it is to play all of your favorite songs on the guitar. IN FACT, if you are not truly astonished by your progress in just one month, return it to us, and we will refund your money, no questions asked.

DON'T WAIT, ORDER NOW!!
Call **(206) 883-9257**, and use your credit card or send $29.95 plus $2 shipping and handling to:

DJ SOFTWARE
10636 Main St Suite #414
Bellevue WA 98004

DON'T FRET, GET EASY GUITAR!!

Circle 448 on Reader Service card

HUSH 80™

HUSH80 CD

- Just plug it into your Commodore 128, 64 or VIC
- No Additional adaptors to buy!
- Portable; Silent; Fast 80 cps; Bidirectional
- User Programable @ 40, 80, 160 Characters per inch;
- Quiet, Compact & Ready-to-Run
- Ask your dealer

Was $139.95
NOW $99.95

The complete Printer that is Silent, Portable & Fast! Paper is included

BUY NOW

Dealer Inquiries Invited.

call 415-363-5966 or
outside California
800-222-HUSH

ERGO Systems, Inc.
303-3 Convention Way
Redwood City, CA 94063

Circle 480 on Reader Service card

HOT ACCOUNTS™

The most highly acclaimed bookkeeping system for the Commodore 64 & 128*

A Superb!
An exceptional program that outshines all others.
RUN Magazine, Nov. 1984

HOT ACCOUNTS™ teaches you bookkeeping as it automatically performs dozens of full-service accounting functions. It is a complete system that will instantly organize your records and receipts and supply charts, formal statements, and budget information. Now your records can be accurate, up to date and confidential ■ Tracks charge cards, checkbooks, all transactions ■ Requires no prior knowledge of accounting ■ Home or small business ■ Improves your financial image ■ Cost less than 1 hour with a C.P.A.

***HOT ACCOUNTS™** Bookkeeping System on Disk for the 64 & 128 in 64 mode.

For **RUSH** delivery, send check or money order for $64.95 to:
C.Ed. Software
3051 India Street
San Diego, CA 92103

Credit card orders, call **toll-free**
1-800-621-0852 ext. 238
VISA MASTERCARD

P.S. *Use* HOT ACCOUNTS ™ *to do your taxes and the price is tax deductible!*

BONUS OFFER (Order now and receive a full featured, 60 function **word processing** & 3-D **business graphics** package as our **FREE** gift to you.

Circle 450 on Reader Service card

BACKUP PROTECTED SOFTWARE *FAST* with COPY II 64/128™

From the team who brought you **COPY II PLUS** (Apple), **COPY II PC** (IBM) and **COPY II MAC** (Macintosh) comes a revolutionary new copy program for the Commodore 64 and 128 computers.

- Copies most* protected software — *automatically.*
- Copies even protected disks in just 2 minutes (single drive).
- Copies even protected disks in just 1 minute (dual drive).
- Maximum of four disk swaps on a single drive.
- Includes fast loader, 12 second format.

Requires a Commodore 64 or 128 computer with one or two 1541 or 1571 drives.

CENTRAL POINT Software, Inc.
9700 SW Capitol Hwy.,#100
Portland, OR 97219

503/244-5782
M-F, 8-5:30, W. Coast Time
CHECK, COD WELCOME
(Prepayment Required)

$39.95
plus $3 s/h ($8 overseas)

*We update Copy II 64 regularly to handle new protections; you as a registered owner may update at any time at a reduced price.

This product is provided for the purpose of enabling you to make archival copies only.

gram will address each of them, since commercial networks differ from one another in their requirements.

Capture buffer. Unless you take steps to save on-line data as it comes in, you'll never see it again. Therefore, the presence and size of a capture buffer is vital—unless the program offers virtual memory that sends data directly to disk or printer. In that case, you can get by with a smaller buffer.

Disk drive access. You never know what goodies you might run across on-line, so make sure that, from within your terminal program, you can format disks, scratch files, and so on. You could, for instance, run across a fantastic game and download it, only to discover it won't fit on your current disk. If you can't format through the terminal program, you'll have to get out of it to do so, and there goes your game.

Climb Aboard

Familiarizing yourself with a local bulletin board system is an excellent introduction to telecommunications. Although the various systems, their costs and the extent of their offerings differ dramatically, the underlying principles are the same. Whether you want to get the facts or the programs, earn a college degree or meet the love of your life, become a chess master or master programmer, it's all there on-line just waiting for you. R

Following is a list of major commercial networks that you can access. For an in-depth look at these services, refer to RUN*'s monthly Telecommunications series, which started in May 1985.*

Address all author correspondence to Peggy Herrington, 1032 Forrester St. NW, Albuquerque, NM 87102.

CompuServe
800-848-8199
In Ohio, 614-457-8650
An H&R Block Company
5000 Arlington Centre Blvd.
Columbus, OH 43220

Delphi
800-544-4005
In Massachusetts, 617-491-3393
General Videotex Corp.
3 Blackstone St.
Cambridge, MA 02139

Dow Jones News/Retrieval
800-257-5114
In New Jersey, 609-452-1511
From The Wall Street Journal
PO Box 300
Princeton, NJ 08540

The Electronic University
800-22LEARN
In California, 800-44LEARN
TeleLearning Systems, Inc.
505 Beach St.
San Francisco, CA 94133

Mnematics
914-365-0184
Mnematics Videotex, Inc.
Sparkill, NY 10976-0019

PeopleLink
800-524-0100
3215 N. Frontage Road, Suite 1505
Arlington Heights, IL 60004

GEnie
800-638-9636, ext. 21
General Electric Information Services
401 N. Washington St.
Rockville, MD 20850

PlayNet
800-PLAYNET
200 Jordan Road, Suite 180
Troy, NY 12180

QuantumLink
800-392-8200
In Virginia, 703-448-8700
Quantum Computer Services, Inc.
8620 Westwood Center Drive
Vienna, VA 22180

The Source
800-336-3366
In Virginia, 703-734-7500
Subsidiary of The Reader's Digest Assn.
1616 Anderson Road
McLean, VA 22102

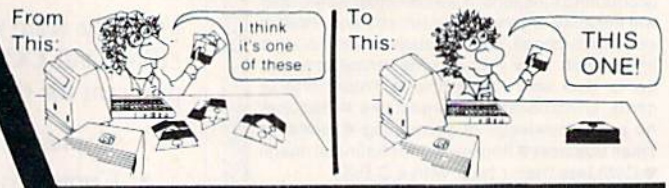
Viewtron
800-543-5500, Dept. 9401
In Florida, 305-674-1444
Subsidiary of Knight-Ridder Newspapers
1111 Lincoln Road, 7th Floor
Miami Beach, FL 33139

Circle 436 on Reader Service card

C-64 & C-128* OWNERS:

Stop playing "Hide-and-Seek" with your Disk software! Let your Commodore 64* "memory" do all the work for you with **MASTERDISK©**. Easy Manual and Program Menu-Screens make everyone a "pro" in 1 day!
Here's a small "PEEK" at SOME of the FULLY-INTEGRATED POWER of PRODUCTIVITY at your fingertips. . .

- a SORTED Master Catalog of ALL your Disks (even those un-listable "protected" Directories: Names, ID's, File info, etc.)
- Search + List any File/Disk/ID in seconds, automatically, in any of SEVEN WAYS.
- Transfer ML-Programs or Files from Disk to Disk (CATEGORIZE your software)
- Stop disaster before it strikes: change duplicate ID's fast, without total re-copy.
- Restore accidentally-scratched files in a flash, with VERIFICATION that they're OK.
- Works with 1 or 2 Single Disk Drives (1541, MSD, etc.) with or without Printer (Commodore or ASCII).
- Handy-Reference Card for HEX/ASCII/BINARY-TO-DECIMAL VALUE TRANSLATION + FORMULAS, included FREE.
- All this + MUCH MORE, for just $34.95. (U.S.A.), $45.95 (Canada)



Now YOU too can get the "Software Edge"!

NEW!! - MASTERDUAL©, "Son of MASTERDISK©" . . . same power, but with Dual Drive Speed!

- Same Catalog Features as MASTERDISK©
- Same Disk repair functions, too
- For all C-64 & C-128* systems with Dual Disk Drives (4040, MSD, etc.)
- Utilizes all Dual Drive functions for maximum speed and ease of use
- FREE Handy Reference Card for HEX/ASCII/Binary to Decimal Translation
- Experience FULLY-INTEGRATED POWER for just $29.95 (U.S.A.), $39.95 (Canada)

***MASTERDISK© and MASTERDUAL© are also compatible with the NEW C-128 (in C-64 Mode)!**

We ship within 24 hours! Send Money Order or Check to:

INTEGRATED-SOFTWARE SYSTEMS
P.O. Box 1R01, Ames, IA 50010
VISA/M.C./C.O.D., Call **(515) 233-2992**
9 am - 9 pm (Central Time) Mon.-Fri.
Add $3 Shipping/plus $2 Foreign, C.O.D.
IA Residents add 4% Sales Tax.

IN CANADA: Cricket Distribution Co.,
P.O. Box 953, Cobourg, Ontario, Canada K9A 4W4
VISA/M.C./C.O.D., Call **(416) 372-3692**
9 am - 6 pm (Eastern Time) Mon.-Fri.
Add $3 shipping/plus $2 for C.O.D.
Ontario Residents add 7% Sales Tax

Whether you have tens or hundreds of disks, now YOU can be the MASTER of your TOTAL Software Library!

SOME HISTORIC BREAKTHROUGHS DON'T TAKE AS MUCH EXPLAINING AS COMPUSERVE.

But then, some historic breakthroughs could only take you from the cave to the tar pits and back again.

CompuServe, on the other hand, makes a considerably more civilized contribution to life.

It turns the personal computer into something useful.

CompuServe is an information service. Just subscribe, and 24 hours a day, 7 days a week, a universe of information, entertainment and communications is at your service.

A few of the hundreds of things you can do with CompuServe:

COMMUNICATE

Easyplex™ Electronic Mail puts friends, relatives and business associates in constant, convenient touch.

CB Simulator lets thousands of enthusiastic subscribers "chatter away" on 72 different channels.

Over 100 Forums welcome you to join their online "discussions." They're for everyone from computer owners and gourmet cooks to physicians and game players.

Bulletin Boards let you "post" messages where thousands will see them.

HAVE FUN

Our full range of games includes "You Guessed It!," the first online TV-style game show played for real prizes; MegaWars III, the ultimate in interactive excitement; board; parlor; sports and educational games.

SHOP

THE ELECTRONIC MALL™ gives you 'round the clock shopping for name brand goods and services at discount prices from nationally known stores and businesses.

SAVE ON TRIPS

TWA Travelshopper℠ lets you scan schedules and fares, find the best bargains and order tickets online.

A to Z Travel/News Service provides latest travel news plus complete information on over 20,000 hotels worldwide.

MAKE PHI BETA KAPPA

Grolier's Academic American Encyclopedia's Electronic Edition is a complete, constantly updated general reference encyclopedia.

The College Board, operated by the College Entrance Examination Board, helps you prepare for the SAT, choose a college and get financial aid.

BE INFORMED

The AP News Wire (covering all 50 states and the nation), the Washington Post, USA TODAY Update and business and trade publications are constantly available. And our electronic clipping service lets us find, clip and file specific news for reading at your convenience.

INVEST WISELY

Comprehensive Investment Help includes complete statistics on over 10,000 NYSE, AMEX and OTC securities. Historic trading statistics on over 50,000 stocks, bonds, funds, issues and options. Five years of daily commodity quotes. Standard & Poor's. Value Line. And over a dozen other investment tools.

Site II provides demographic and sales potential information by state, county and zip code for the entire country.

And now for the pleasant surprise.

Although CompuServe makes the most of any computer, it's a remarkable value. You get low start-up costs, low usage charges and local-phone-call access in most major metropolitan areas.

Here's how to use CompuServe.

CompuServe is "menu-driven," so beginners can simply read the lists of options on their screens and then type in their selections.

Experts can just type in "GO" followed by the abbreviation for whatever topic they're after.

In case of confusion, typing "H" for help brings immediate instructions.

And you can ask general questions either online through our free Feedback service or by phoning our Customer Service Department.

How to subscribe.

To access CompuServe, you'll need a CompuServe Subscription Kit; a computer, terminal or communicating word processor; a modem and in some cases, easy-to-use communications software.

With your Subscription Kit, you'll receive a $25 usage credit, a complete hardcover Users Guide, your own exclusive user ID number and preliminary password, and a subscription to CompuServe's monthly magazine, *Online Today*.

Subscription Kits are available in computer stores, electronic equipment outlets, retail stores and catalogs. You can also subscribe with materials you'll find packed right in with many computers and modems sold today.

Make a move of historic proportions. Subscribe to CompuServe today.

To receive our free informative brochure or to order direct, call or write:

CompuServe®

Information Services
P.O. Box 20212, 5000 Arlington Centre Blvd.
Columbus, OH 43220

800-848-8199
In Ohio, call 614-457-0802

EasyPlex and ELECTRONIC MALL are trademarks of CompuServe, Incorporated. Travelshopper is a service mark of TWA.

An H & R Block Company

Circle 413 on Reader Service card.

C-128 Programmer's Aid

The C-128 is a programmer's delight. Its enhanced Basic features many more programming aids than the C-64, so you can take command of your programming with ease.

By MORTON KEVELSON

The Commodore 128 has one of the most powerful and comprehensive Basics of any personal computer currently on the market. Numerous commands result in direct access to the computer's sound and graphics capabilities, so you needn't Peek and Poke your way around the hardware.

Basic's direct memory commands were originally intended as a link to machine language. This link permits access to hardware-dependent features that are beyond the capabilities of Basic. The advent of the C-128 and Basic 7.0 has greatly diminished the need for this link.

However, having an extended Basic also puts a greater burden on you, the programmer, to learn numerous additional commands. The syntax for many of these commands reflects the inherent complexity of the tasks they are designed to do. Also, with more commands to enter, the greater are your chances of making errors.

Fortunately, Basic 7.0 provides additional commands to ease the task of program composition and to assist you in exterminating the unavoidable bugs. Several housecleaning commands will promote neater, more structured programs.

Since these commands relate to all aspects of Basic programming, it is important to take a detailed look at how each one works. It is to your advantage to become familiar with these commands so that their use becomes a matter of habit.

Automatic Line Numbers

Let's begin with line numbers. Aside from being a convenient place to hang a Goto or Gosub statement, line numbers have little to do with the logic of your program. In fact, there are languages that are specifically designed to eliminate line numbers entirely. Pascal is an excellent example.

Code written in Pascal has an elegance that would only be hindered by the use of line numbers. Basic 7.0 has adopted some of Pascal's program structures.

Think of how many keystrokes are devoted to line numbers in an average Basic program. The C-128 allows for 160 characters (as you shall soon see), but the typical Basic line is less than 40 characters long. Given an average of three digits for a line number, you'll spend nearly eight percent of your keystrokes on line numbering. The C-128 allows you to do away with all this. Basic 7.0's Auto command will automatically generate the line numbers for you. The full syntax is

```
AUTO increment
```

where the increment is the numerical difference between line numbers.

If you enter AUTO 10, followed by a carriage return, nothing noticeable happens until the next time you enter a Basic program line. Then Basic 7.0 will automatically display the next program line, incremented by 10.

To stop automatic line numbering without turning it off, hit the return key on an empty line number. Later, you can restart this function simply by entering a line with a new line number. Or, if you prefer, you can change the increment by reissuing the Auto command. To turn off this function completely, simply enter it without a line number.

An unexpected benefit of the Auto command is the

Photograph by David Bradshaw

POWER
CONTROL
RUN STOP
SHIFT LOCK
SHIFT

"My purchase of RUN *is a better investment than my computer—I get a much higher return on a much smaller investment!"—*

D. Suggs, Tallahassee, Fla.

Join the thousands of C-64, Plus/4, and VIC-20 users around the world who enjoy subscribing to **RUN** every month. They've found **RUN** to be an unrivaled Commodore resource. And they're right—**RUN** is one of the fastest-growing Commodore magazines on earth!

The convenience of personal delivery, plus a savings of **44% off** the newsstand price are yours when you subscribe to **RUN**—the year-round Commodore companion.

You get **12 great issues for just $19.97,** plus special announcements and offers available only to **RUN** subscribers!

Each month, you'll learn the fun of computing while exploring the limitless possibilities of your Commodore.

Here's what satisfied readers are saying:

"I read many magazines after I bought my 64, but I think that yours is the best. I now have a subscription and look forward to every new issue."—Eric D. Stolen, Manistee, MI

The Home User's Guide to Commodore Computing
RUN
EXERCISE!
Shape Up with Your C-64
MAKING FACES With Your C-64 & VIC-20
MONITORS or TV? See the Difference

"In a remarkably short time, **RUN** has become the best journal for Commodore computer users...I appreciate the coverage you devote to reader comments and questions (Magic, Mail RUN, and Commodore Clinic), as there is nearly always an interesting hint or tip in one of these columns!"—J. O'Hare, Victoria, B.C. Canada.

Throughout the year, you'll find:

- Exciting tips, Commodore tricks, and programming ideas in **RUN**'s most popular column, "Magic".
- Challenging, fun, and educational software.
- A rundown of the products best suited for the new C-16 and Plus/4.

The benefits roll on...time-saving programming ideas, no-punches-pulled product reviews, applications to broaden your computing horizon, tutorials and assistance from reknowned authors in the Commodore field, and of course, great ideas and tricks that have worked for fellow Commodore users.

Act today—and **save 44%**—joining the thousands of subscribers who've found that **RUN** is their best computing companion. Just send in the coupon or insert card, or call **TOLL-FREE 1-800-258-5473**. In NH, dial 1-924-9471.

Commodore 64, VIC-20 and PLUS/4 are registered trademarks of Commodore Business Machines, Inc.

YES! I want to make a great investment.

Send me 12 issues of **RUN** for the low subscription price of $19.97. I'll save 44% off the newsstand price.

☐ Payment enclosed ☐ Bill me

Name _____

Address _____

City _____ State _____ Zip _____

Canada & Mexico $22.97; Foreign Surface $39.97, 1 year only, US funds drawn on US bank. Foreign airmail, please inquire. Please allow 6 to 8 weeks for delivery.

RUN • Box 954 • Farmingdale, NY 11737 RN361B35

RUN

Circle 456 on Reader Service card

And your Earls and Viscounts. If you've got royal ancestors, we have the noble software that can help you trace them down.

Family Roots and your Apple, IBM, Commodore, Kaypro*, and many others, offer individual and group sheets, charts, name indices, general search and text capabilities. Adapts to most disk drives, printers, and screens. You get more utility programs, plus lots of personal control. A comprehensive (new) manual is included.

Put up your dukes!

All for just $185.

Write or call today for more information and a free brochure.

Quinsept, Inc.

P.O. Box 216
Lexington, MA 02173
(617) 641-2930

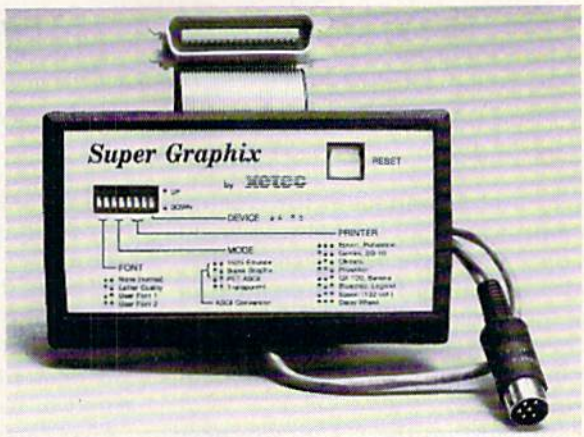
American Express, Visa, and MasterCard gladly accepted.

Family Roots™

* *Trademarks for Apple Computer Inc., International Business Machines, CBM, Inc. and Digital Research.*

Circle 451 on Reader Service card

Super Graphix



You Asked For It . . . Here It Is!!!

GRAPHICS and FONTS plus an 8K BUFFER for the ultimate in performance and speed. The XETEC Super Graphix interface for Commodore Computers now offers a new high in technology with these features:

- 8K Buffer Standard
- 10 Printing Modes
- 3 Internal Screen Dumps
- Extensive Command Channel
- Reset Button to Halt Printing from Buffer
- Switch Settings on Label for Quick Reference
- Correspondence Quality Font Built-In
- Capable of Storing 2 Additional Fonts
- Correct Graphics/Text Aspect Ratio for all Major Printers
- 8 Active Switches with Changes Constantly Monitored
- Internal Fonts Support Super-script, Sub-script, Underlining, Bold-face and Choice of 9 Pitches

Suggested list $99.95 • ***Includes Lifetime Warranty***

XETEC, Inc. / 3010 Arnold Rd. / Salina, KS 67401 / 913-827-0685

Circle 483 on Reader Service card.

Uni-Kool

DISK DRIVE FAN FOR COMMODORE

Designed to work with Commodore Disk Drive Models 1540, 1541, SFD 1001, the quiet C-100 fan enclosure moves cool, filtered air through the top vents of the disk drive cooling the drive and thereby reducing the misalignment problems caused by heat build-up. A custom filter keeps room dust from entering the disk loading opening. This greatly increases the life span of the disk drives, and decreases the maintenance required to keep the drive functioning properly. Only $39.95 plus $2.50 for shipping and insurance.

115 vac

Money Order, Checks or C.O.D. Only

6-month warranty

Uni-Kool (503) 476-1660
909 Williamson Loop, Grants Pass, OR 97526

(Commodore is a registered trademark of Commodore Business Systems)

Circle 435 on Reader Service card

64-ACCOUNTING

Complete • Fast • Easy

The **64-Accounting** System was specifically designed to do your personal and small business accounting faster, easier and more completely than any other program on the market. And it does!

- **Financial Statements**
- **Detailed Trial Balance**
- **Check Writing**
- **Statement Printing**
- **Checkbook Reconciliation**

Take the guesswork out of the numbers game. Order or receive additional **64-Accounting** information today! **$69.95**

Dealer Inquiries Welcome

Call 1-800-553-0002
In Iowa, 1-800-772-5771

SOFTWARE DESIGN, INC.
1945 Mitchell Avenue • P.O. Box 570 • Waterloo, Iowa 50704

Missing Link Uncovered!

Here's a C-128 command that the Commodore engineers omitted—Basic Append, which lets you link together Basic program files.

Basic 7.0 has some very useful commands for creating and editing programs, but it lacks a command for combining Basic programs once they have been saved to disk. This article will provide you with a Basic Append command that will let you add program lines to the end of any Basic program in memory. (Do not confuse this command with the built-in Basic 7.0 Disk Append command, which combines sequential files.)

To implement this command on the C-128, you need only a basic understanding of how a program is stored in memory.

On the C-128, Basic program storage starts at address 7168 in RAM bank 0. Basic requires that the content of this address is always a zero. The next two bytes act as a pointer, or link, to the start of the next line of Basic. These bytes are actually the start of the Basic line. The fourth and fifth bytes contain the Basic line number. The last byte of the line is always a zero. This pattern repeats itself until the end of the program. Basic reminds itself where the program ends by storing two zeroes as the last line link.

As part of Basic's organization, the start and end of program text are also stored in zero-page to help the operating system keep track of data for its own various purposes. You can take advantage of this knowledge to fool Basic in regard to where the program is stored in memory. A little cleverness on your part can even cause Basic to append the next program.

The only restriction to this process is that the appended program's line numbers must be greater than the line numbers of the program in memory. This is easily accomplished, since you can use the C-128 Renumber command to give the existing program low line numbers. Just remember always to save your Basic program modules with high line numbers.

To append a program, you must change the contents of memory locations 45 and 46. This is where the pointer to the start of the Basic program is kept, in low-byte, high-byte format. To calculate the start address, you have to multiply the contents of 46 by 256 and add the result to the contents of 45. In Basic, this can be easily done by:

```
PRINT PEEK(46)*256+PEEK(45)
```

Changing the contents of locations 45 and 46 changes the start-of-Basic pointer. However, before you can do this, you have to know just two more bytes of information, involving where the program ends.

Memory addresses are stored in a two-byte format, since a single byte can only contain values that range from 0 to 255. To store any of the possible 65536 addresses that the 8501 microprocessor can look at, two bytes are required.

Ready to Append

On the C-128, the end of the Basic program is stored in addresses 174 and 175. You need only transfer this information to locations 45 and 46 and you can proceed with the Basic Append command.

However, the address stored in 174 and 175 actually points to the location immediately after the two zero bytes at the end of the Basic program. This is two bytes further than you want. You will have to be careful how you decrement this address. Remember, the address is stored in two parts.

First check to see if the content of 174 is greater than 1. If it is, simply subtract 2 and Poke the result into address 45, then Poke the contents of 175 into address 46. If 174 contains a 0 or a 1, then add 256 before subtracting two. You will also have to decrement the content of 175 by 1 before transferring it to 46.

The following Basic program will do the job for you:

```
1 IF PEEK(174)>1 THEN POKE45,PEEK(174)-2:POKE46,PEEK(175):
  ELSE POKE45,PEEK(174)+256-2:POKE46,PEEK(175)-1
2 END
```

Note how the program uses Basic 7.0's If. . .Then. . .Else structure.

Run the program. When the Ready prompt appears, just load in the module you wish to append.

To complete this process, the start-of-Basic pointer in locations 45 and 46 has to be restored to its original state. A simple

```
POKE 45,1:POKE 46,28
```

will restore the start of Basic to the default values.

The simplest way to implement the Append command is by placing the two-line program at the start of your main program. Whenever you wish to append something to your main program, load and run your main program. Then load the module you wish to add. Next, restore the start-of-Basic pointers. (Always remember to do this before adding any other modules.) Also, be sure to keep your program lines in proper order, using the Renumber command.

The following briefly outlines the sequence of commands when appending programs.

```
 1. LOAD and RUN APPENDER
 2. LOAD "MOD 1",8
 3. POKE45,1:POKE46,28
 4. RUN
 5. LOAD "MOD 2",8
 6. POKE45,1:POKE46,28
 7. RUN
 8. LOAD "MOD 3",8
 9. POKE45,1:POKE46,28
10. RUN
11. LOAD "MOD 4",8
12. POKE45,1:POKE46,28
```

If you list after steps 1, 4, 7 and 10 there will appear to be no program in memory. If you enter RUN 10 after steps 3, 6, 9 and 12, the combined programs will execute.

virtual elimination of the new-screen-line syndrome. This occurs when you enter a line that requires the entire width of the screen; the cursor then moves automatically to the beginning of the next line.

A weary programmer will often type the next line number without hitting the return key. This enters the second line as part of the first. Even the listed line may not reveal the problem, as the screen display will usually appear as two separate lines. Having the computer do the numbering is a sure way to avoid this particular problem.

Calling for a Recount

Unless you're one of those rare individuals who possess a flawless sense of logic, combined with the patience to flowchart every detail, you'll soon find yourself in the Basic programmer's bind.

As a program develops, additional lines are often inserted between existing line numbers. Before you know it, you may exhaust the possibilities. This invariably happens in the middle of a long program, making manual renumbering a tedious chore.

At this point, the notorius Goto statement comes into play. In fact, it is this local shortage of available line numbers that leads to the most horrible examples of convoluted code. If you are like most programmers, you will also find that the line you accessed with the Goto statement soon succumbs to a similar bind.

Basic 7.0 provides a way out. The Renumber command will automatically resequence the entire program, starting with line 10 and incrementing by 10. The full syntax of this command is

```
RENUMBER new number, increment, old number
```

where "new number" is the new starting line number, "increment" is the same as for automatic line numbering, and "old number" is the old line number at which to start renumbering.

This is a fully implemented renumbering, where proper treatment is given to line numbers in Goto and Gosub statements. This property of renumbering leads to a highly desirable side benefit of the Renumber command.

Just think of how much debugging time is spent on resolving all those Goto and Gosub statements that no longer refer to valid program lines. How about those memory-wasting, but otherwise innocuous, line references that remain after some routines are eliminated. Aside from the space they take up, these can be a real nuisance when you're trying to analyze a program.

The Renumber command will flag these for you in all Gosub and Goto statements that no longer call existing line numbers. They will cause the renumbering function to abort with an

```
?UNRESOLVED REFERENCE ERROR IN (line number)
```

message. This is an ideal way to head off these errors in a single pass.

Of course, all this will work wonders when it comes to opening up space in your program for additional code. Also, remember that you don't need to renumber the entire program. The old-number parameter takes care of that. The only missing feature is the ability to renumber a range of line numbers within a program.

Try It Out

If you haven't already typed in a short program, I suggest you do so at this time. Things are going to get a little more complicated, and being able to work along will be a great help. Just go into Auto mode and type in some Print statements separated by some Goto statements. Try out the Renumber command until you get a feel for it. When you're ready, read on.

The Function Keys

If you've been practicing, you may have found yourself typing the Auto and Renumber commands several times. It may have occurred to you that a lengthy programming session could result in many repetitions of these commands. Well, you can let the C-128 do the bulk of this work for you. The Key command lets you assign any string, up to a total of 255 characters, to the function keys.

When the C-128 is first turned on, the function keys are automatically assigned eight useful Basic phrases. These can be viewed by entering KEY without any parameters. The contents of all eight function keys will be listed to the screen. You may want to change the key assignments when you are planning a lengthy programming session. For example, by entering

```
KEY 1, "RENUMBER,100,10,1" + CHR$(13)
```

you can renumber your entire program in increments of ten, starting with line 100, every time you hit f1.

Examine the contents of the other function keys and compare them with your programming habits. You should be able to come up with suitable substitutions in a short time.

It may turn out that you need different function key patterns, depending on what you are doing. The Key command works under program control as well as in Immediate mode. Just save several sets of Key commands on disk for your various computing needs.

Trace That Code

One of the more common programming problems is the bug that causes your keyboard to lock up. This is usually due to some unforeseen flaw in the program's logic.

Unlike the pervasive Syntax error, there's no way for the computer to warn you about flaws in your logic. Experienced programmers have learned to insert, during program development, numerous Print statements, which display the status of key variables at regular intervals. With the C-128, before you execute the line, the Trace commands let you continuously monitor your program's progress by automatically displaying the current Basic line number in square brackets. The disadvantage is that this sometimes changes the screen format. Nevertheless, it is an invaluable aid. The syntax is straightforward. Just execute TRON or TROFF in Immediate mode.

While tracing a program, it's helpful to keep a ready finger hovering over the no-scroll key, located in the center of the keyboard's top row. A quick jab at an opportune moment will freeze program execution. A second jab restarts program execution where it left off. The no-scroll key is also very useful for pausing program listings, and the like.

Catch Those Bugs

The best thing to do with program bugs is trap them. It's no wonder Basic 7.0 includes the Trap command for that very purpose. Its use is straightforward. Just include it at or near the beginning of your program.

The Trap command uses a line number as a parameter. When a Syntax error is encountered, the program branches to the Trap command's line number and continues execution there. Add the following to your sample program:

```
1 TRAP 1000
1000 HELP
1010 SLEEP 5
1020 RESUME NEXT
```

This assumes that your last program line is less than 1000. If it's not, just use a higher line number or the Renumber command. Before running this program, include an error in one of the program lines. Try a print command without quotes, like:

```
:PRINT HELLO
```

Note the use of the colon as a separator.

Now run the program. When the error is encountered, the program will branch to line 1000. The Help statement will display the faulty statement with the error highlighted in reverse (underlined on the 80-column screen). At line 1010, the computer will pause for five seconds, after which it will resume execution with the line immediately following the error.

If you want to know more, add the following line:

```
1005 PRINT "ERROR";ER;" ";ERR$(ER);"IN LINE";EL
```

This will add to the display the Basic 7.0 syntax error number, the text of the corresponding error message and the offending line number. Note that ER and EL are reserved variables in Basic 7.0, so you should not use them as variables in your program.

Also, ERR$ is a function that requires one of Basic's syntax error numbers as a parameter. You can use a simple For...Next loop to print out all the error messages.

The Resume command also includes built-in flexibility. A program line number can replace the Next command, allowing a branch to a specific line number. Both the Trap and Resume commands are properly identified by the Renumber command.

As a final word on this topic, keep in mind the help key at the top of the keyboard. You can always use it immediately after a Basic error to display the affected line in Immediate mode.

Cleaning Up

I've saved the most destructive command for last. The Delete command permits wholesale decimation of program lines. It accepts one or two line numbers as parameters in the same format as the List command. Gone are the days of laboriously deleting program lines by entering one line number at a time. Entire ranges of lines will fall prey to the Delete command. Saving Basic routines is now a reality.

One word of caution about using the Delete command: Try listing the doomed lines just to make sure they are what you really do not want. This simple precaution may save much frustration. The syntax is:

```
DELETE # – #
```

The Full Screen Editor

The C-128 has all the screen-editing features found on previous generations of Commodore computers. These include four-way cursor control, with the ability to insert or delete characters any place on the screen. In addition, numerous enhancements to the screen editor bring it into the class of a full-featured word processor. As you might expect, the enhanced editor goes a long way towards easing the task of Basic program entry.

To begin with, the Basic input buffer will accept up to 160 screen characters for a single program line. This is two full screen lines in 80-column mode or four screen lines in 40-column mode. There's one catch. The screen linker does not know where to stop. It will continue to link screen lines beyond the 160-character limit.

Any attempt to enter this text results in a String Too Long error. This may be a blessing in disguise compared to, for example, the Commodore 64. When faced with this situation, it simply acts on the two most recent screen lines, and the results aren't always what you would expect.

If you're not familiar with the concept of linked screen lines, don't be overly concerned. It's a built-in feature of the full-screen editor on all Commodore computers. The line linker remembers the start of the Basic line that is being entered on the screen. It lets you write program lines that are longer than the width of the screen.

On the VIC-20, up to four lines, or 88 characters, can be linked. On the C-64, the limit is two lines, or 80 characters. The C-128 allows the entire screen to be linked. However, only 160 characters will be accepted by the Basic parser.

The most useful editor enhancements are in the form of ESC-key command sequences. Each command is executed by pressing the ESC key, followed by the appropriate keyboard character. The most popular enhancements for Basic programmers are the Insert mode (ESC A), Insert Line (ESC I) and Delete Line (ESC D).

The first of these inserts all text at the current cursor position, while pushing the remainder of the screen ahead. Note that the Insert command does not place the editor in Quote mode. The Insert Line command opens up a single screen line (40 or 80 columns). The Delete Line command removes an entire linked line, so use it with care.

Other ESC key commands that will be popular with Basic programmers clear all or part of the screen or all or part of a linked line. Veteran Commodore users will definitely appreciate the Cancel Quote Mode (ESC O).

Last, but not least, the C-128 provides several ways for you to write brief notes or reminders on the display. Simply type your message on one part of the screen and set up a window using the ESC T (top-left corner) and ESC B (bottom-right corner) commands. All subsequent screen operations will be restricted to the designated window without disturbing the message area.

If you're fortunate enough to have both a 40- and 80-column monitor, or if you are using the new Commodore 1902 monitor, then one of the displays can be reserved as a scratch pad while you use the other for program entry. Screen output can be rapidly directed as desired by using the ESC X command.

The C-128 is equipped with separate 40- and 80-column video display chips. Each of these has its own video RAM. Thus, text on one of the displays is not disturbed by video activity on the other.

With all of these features, you will find it hard to ask for more. The C-128 is a delight. R

Address all author correspondence to Morton A. Kevelson, PO Box 260, Homecrest Station, Brooklyn, NY 11229.

Circle 422 on Reader Service card

FOOTBALL/BASKETBALL C-64 (DISK)

- Play Head to Head, you vs. Computer or Computer vs. Computer.
- Statistical recap printed at end of each game to screen or printer.

3 in 1 College & Pro Football

THE GAME...3 versions are offered in 1 game. College, NFL and USFL.11 offensive & 6 defensive plays. Individual player & Team stats are kept. Unsurpassed realism.

- 3 in 1 football including 167 '84 college, 28 '84 NFL, 18 '84 USFL Teams. $29.99
- (Special) 162 Great NFL/AFL teams of the past $3.00
- 174 Great College Teams of the Past ('59-'82) $10.00
- NFL Past Seasons (170 Teams) '41, '42, '48, '49, '50, '52, '56, '59, '63, '78, '82. $12.00
- 95 '83 College, 28 '83 NFL, 18 '83 USFL, 48 NFL Great Past. $12.00

College Basketball/Pro Basketball

THE GAME...Plays fast and easy. You make all the crucial decisions. Select lineups, defense, offensive style. Each player contributes just as they did in real life.

- Final Four College basketball Including 286 '84-'85 teams and 69 Great Teams of the Past ('56-'82). $29.99
- Basketball-the PRO GAME including 23-'84-'85 teams: 81 teams of the past ('55-'84) $29.99
- (Special) 80 NBA/ABA great past teams $3.00

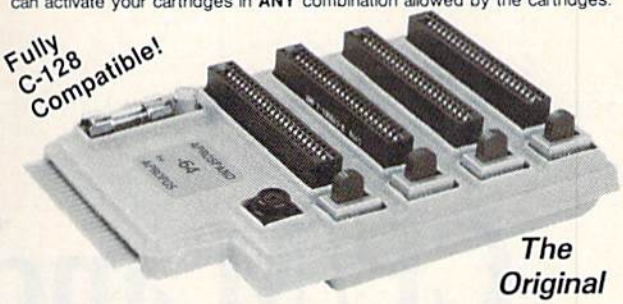
Cash / Check / Money Order

LANCE HAFFNER GAMES:
P.O. Box 100594 • Nashville, Tennessee 37210
(615) 228-4268

Circle 69 on Reader Service card.

APROSPAND-64™

Gives your Commodore 64 or 128 full expandability! This superbly designed expansion module plugs into the expansion port & gives you 4 switchable (singly or in any combination) expansion connectors - plus fuse protection - plus a reset button! Before you buy an expander, be sure that it has a fuse to protect your computer and that you can activate your cartridges in **ANY** combination allowed by the cartridges.



Reduced to ONLY $29.95

Commodore Interfaces and Accessories

ParallAX-CD Parallel Printer Interface for use with all Commodore incl. SX-64 (except PET)	$59.95
DSI PPI Printer Interface with Graphics	$44.95
Cardprint G-WIZ Printer Interface	$48.95
Cardprint +G Printer Interface	$39.95
TH002 300 Baud Direct Connect Modem	$35.00
RAMAX-VIC-20 2 Slot Expander w/27K RAM	$59.95
RAMAX Kit. RAMAX without RAM	$24.95

Add Shipping Per Item: $3.00 Cont. U.S. $6.00 CAN, Mex, PR, HI, AK, UPS Blue

APROTEK
1071-A Avenida Acaso, Camarillo, CA 93010
CALL OUR TOLL FREE ORDER LINES TODAY:
1-(800) 962-5800 USA or 1-(800) 962-3800 CALIFORNIA
TECHNICAL INFORMATION: 1-(805) 987-2454
CA Res. Add 6% Tax
Listed are cash prices.
Visa or MC add 3%
All Products have 2 Week Satisfaction or Money Back Guarantee

MOVING?

SUBSCRIPTION PROBLEM?

Get help with your subscription by calling our new toll free number:

1-800-645-9559*

between 9 a.m. and 5 p.m. EST, Monday–Friday.

If possible, please have your mailing label in front of you as well as your cancelled check or credit card statement if you are having problems with payment

If moving, please give both your old address and new address.

* New York State residents call 1-800-732-9119.

Circle 454 on Reader Service card

IT'S LIKE FREE DISKETTES

Your 5¼" single side disks are usable on the other side. You paid for one side, why not use the other... **IT'S FREE!**

Nibble Notch will **open** your **new** disk. It's easy...won't harm existing data. Try it!

nibble notch I for Apple, Franklin, Commodore & Atari (w/Atari Drives) square notch.

ONLY $14.95* PLUS P&H

ALSO DISK SURGEON

Software for C-64 & 1541 Drive

- Read data from, edit & write to disk
- Analyze disk errors without "hammering"
- Read data under errors, erase errors
- Format a single track with any ID
- File copy to copy portions of a disk
- Single track copy • 4 minute copy of entire disk, and much more

FREE Nibble Notch
Buy the Disk Surgeon, get Nibble Notch 1 **Free!** A $45 value.
$29.95* FOR BOTH! PLUS P&H

QUALITY DISKETTES low as 99¢

*Add $2 ($5 foreign) for postage & handling. FL residents add 5% sales tax.

TOLL FREE 1-800-642-2536
FL (305)748-3770
or send check or money order to:

nibble notch® computer products
4211 NW 75th Terrace • Dept. 165 • Lauderhill, FL 33319

CP/M and the C-128

Here's an introduction to the wide world of CP/M, along with a discussion of its numerous applications and software.

By CHERYL PETERSON

Until the proliferation of MS-DOS computers, CP/M (Control Program for Microcomputers) was the largest-selling computer operating system available for non-mainframe computers. Most of the earliest desktop, or small-business-size, computers could run CP/M.

Developed by Gary Kildall of Intel for a thrown-together collection of hardware, CP/M eventually became the keystone of a multi-million-dollar corporation called Digital Research.

Although Digital Research originally offered only a plain-vanilla version of CP/M, Lifeboat Associates modified it to run with TRS-80, Altair, Heathkit and other early 8080 and Z-80 microprocessor-based computers. Soon, other manufacturers started offering it with their computers.

Although Altos, Exidy, Vector and Onyx all offered CP/M with their computer systems, the most noteworthy "bundler" was Osborne Computer Corp. By offering the operating system and useful software packages with the Osborne 1 transportable computer, Osborne opened the door to true computing power for thousands of non-technical people who wanted to use a computer without first having to earn a degree in computer science.

An interesting testimony to the popularity of CP/M is the estimation that the largest family of CP/M computers in existence today are Apple IIs. According to one industry expert, the most frequently purchased add-on product for an Apple II is a CP/M card.

During its short life, CP/M has gone through changes and improvements, but has generally kept an upwardly mobile structure. Its latest incarnation, CP/M Plus, can run most programs created with earlier versions of CP/M. This means that the software base for CP/M computers also just keeps growing.

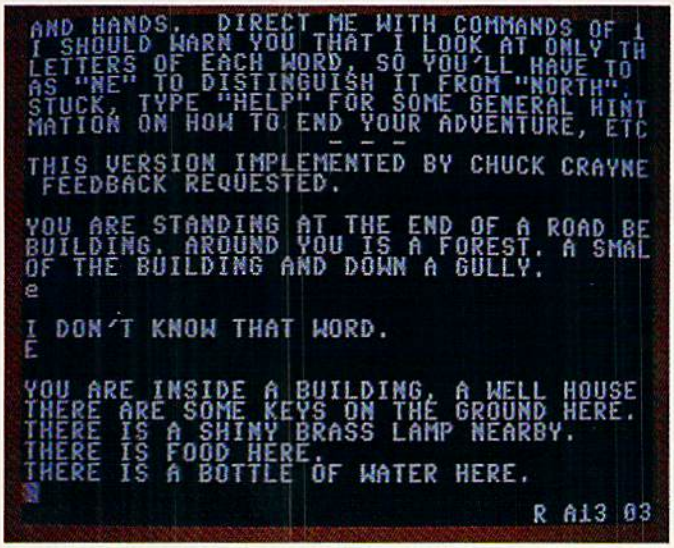
Though it performs some functions of a programming language, CP/M itself is not a language. Using a couple of utilities that are frequently offered with CP/M (ED and ASM), it's possible to write machine language programs. However, this type of programing is beyond the novice computer user.

An operating system controls all communication between the different parts of a computer system: monitor, drives, keyboard, serial port and all other input/output ports. In early computer systems, input and computer response were done via a series of switches and lights on what was called a console. In some CP/M books, you may still see the primary I/O devices referred to as the console.

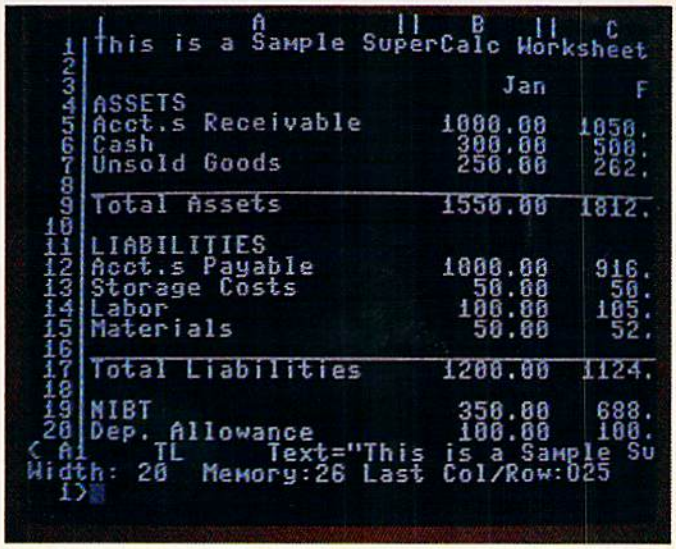
Later, a typewriter-style I/O interface was used. This evolved into the CRT and keyboards that today we use and call terminals. Some CP/M software manuals refer to terminal emulation in their specifications. Most software that supports the Lear Siegler ADM3A or ADM31 terminals should work fine with the Commodore 128.

One big advantage to using CP/M is the great amount of software already available. The sales of most new computers suffer from an initial lack of useful programs. And since software developers are reluctant to program on machines that don't have a large number of users, these machines may never gain the necessary software base.

Another advantage is the existing user base. There are hundreds of CP/M-machine-based user's groups across the country. If you run into a problem, someone from your local group may be able to provide a solution. Local user's groups are also good sources of purchasing recommendations. Other users may be aware of the perfect software package to suit a particular need. User's group newsletters frequently provide hints and tips on how to get more use out of your computer.


AND HANDS. DIRECT ME WITH COMMANDS OF 1
I SHOULD WARN YOU THAT I LOOK AT ONLY TH
LETTERS OF EACH WORD, SO YOU'LL HAVE TO
AS "NE" TO DISTINGUISH IT FROM "NORTH".
STUCK, TYPE "HELP" FOR SOME GENERAL HINT
MATION ON HOW TO END YOUR ADVENTURE, ETC
THIS VERSION IMPLEMENTED BY CHUCK CRAYNE
FEEDBACK REQUESTED.
YOU ARE STANDING AT THE END OF A ROAD BE
BUILDING. AROUND YOU IS A FOREST. A SMAL
OF THE BUILDING AND DOWN A GULLY.
e
I DON'T KNOW THAT WORD.
E
YOU ARE INSIDE A BUILDING, A WELL HOUSE
THERE ARE SOME KEYS ON THE GROUND HERE.
THERE IS A SHINY BRASS LAMP NEARBY.
THERE IS FOOD HERE.
THERE IS A BOTTLE OF WATER HERE.
R A13 03

A public domain program called ADVENTUR runs on the 128. It is similar to the Zork series of games from Infocom.


| A | B | C
1 This is a Sample SuperCalc Worksheet
3 Jan F
4 ASSETS
5 Acct.s Receivable 1000.00 1050.
6 Cash 300.00 500.
7 Unsold Goods 250.00 262.
9 Total Assets 1550.00 1812.
11 LIABILITIES
12 Acct.s Payable 1000.00 916.
13 Storage Costs 50.00 50.
14 Labor 100.00 105.
15 Materials 50.00 52.
17 Total Liabilities 1200.00 1124.
19 NIBT 350.00 688.
20 Dep. Allowance 100.00 100.
< A1 TL Text="This is a Sample Su
Width: 20 Memory:26 Last Col/Row:025
1>

This is a spreadsheet being viewed with SuperCalc. It shows approximately half of the 80-column screen.

Local user's groups may also control a library of public-domain programs that are both useful and inexpensive. In fact, most user's groups ask little more than a copying fee that covers the cost of the disk and the time it takes someone to make the copy. Generally, the proceeds from such sales are used to finance hardware purchases needed to keep the user's group working.

Because of its wide acceptance over the years, CP/M is most useful to those with small-business applications such as accounting, financial modeling, word processing, spreadsheets and databases. In general, it is most useful in applications that use words and numbers as opposed to pictures.

Unfortunately, few CP/M programs exist that make extensive use of graphics. Although packages can be written and tailored to specific machines, graphics applications are difficult to write and have a limited market. Since there isn't any C-128 CP/M graphics software currently available, business users who need charts and graphs made from CP/M accounting, spreadsheet or database information would be at a disadvantage running the 128.

Compatibility Problems

The amount of compatibility depends on several factors. Standard CP/M as offered by Digital Research must be customized, depending on a system's disk drive, peripheral interface and keyboard. As mentioned earlier, terminal emulation affects the appearance of data on the screen. In the case of the 128, there are unique chips that must also be addressed.

As the Commodore 64 uses the Kernal tables to handle most of the internal communication, CP/M uses two tables called BIOS (Basic Input/Output System) and BDOS (Basic Disk Operating System).

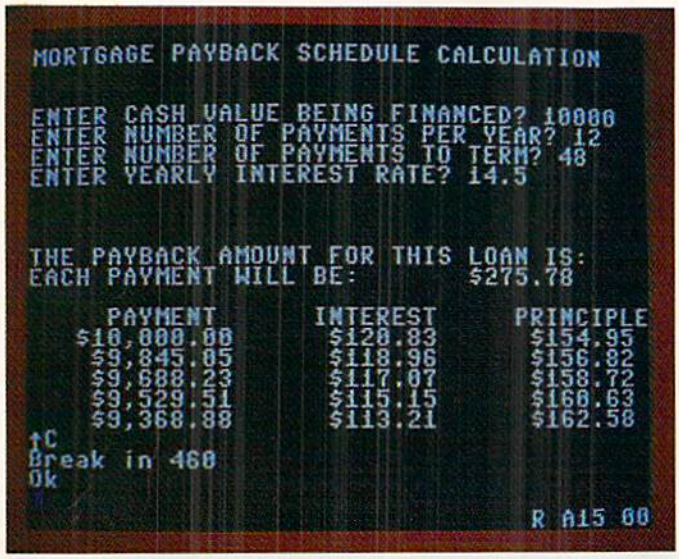
In order for a CP/M program to be easily transported from one machine to another, calls to these tables must conform to a minimum standard. These routines may have been altered (improved) to make the C-128 function more efficiently, but such improvements can reduce compatibility. As far as I've seen, however, the 128 is compatible with existing software.

Another incompatibility centers on the disk drive. The track and sector information used for different CP/M systems can vary widely, even within the product line of a single company. When transporting software between machines, this can be the biggest headache. If incompatible disk formats are used, then the main way to get software into a new machine is by using one of the ports, such as the serial port, with a modem. The other alternative is to rewrite the software specifically for the new computer.

However, Commodore has done an admirable job in designing the 1571 disk drive for maximum flexibility. The 1571 will read CP/M disks that have been created with a variety of machines.

Disks created using the GCR format of the C-64 CP/M cartridge are compatible. While this gives you more CP/M programs to choose from, the GCR format won't prove to be popular with most 128 owners, since many companies do not plan to offer their CP/M software in that format. Several MFM-formatted products written for the Osborne 1 computer will run on the C-128. (See Table 1.) For those who have public-domain programs or other packages already in GCR format, it's comforting to know that the Commodore 128 will run those programs without further modification.

Besides the GCR format, the 128 also reads the IBM MFM format. Several computers, including the Epson



This mortgage program is running under Microsoft BASIC 5.0 Osborne 1 format.

Program	Manufacturer
WordStar	Micropro
SuperCalc	Sorcim
Spellguard	Sorcim
Electric Webster	Cornucopia
The Word Plus	Oasis Systems
Punctuation & Style	Oasis Systems
Grammatik	Aspen
MBASIC	MicroSoft

Table 1. Osborne 1 MFM-formatted software that runs on the C-128.

QX-10, Kaypro 2, Kaypro 4 and both the Osborne 1 and Executive, use this format.

To date, I have tried over a dozen Osborne 1 software packages that worked straight out of the box. These include Micropro's WordStar and MailMerge, Sorcim's SuperCalc and Microsoft's MBASIC. NewWord, a WordStar clone that sells for $100, seemed to work well.

I have run three different spelling checkers (Electric Webster, Spellguard and The Word Plus) and two grammar checkers (Punctuation & Style and Grammatik). Also, two database programs, Filebase and File-It, ran flawlessly.

Kaypro software didn't fare as well. I tried WordStar and NewWord. Although they loaded properly and seemed to work, the screen formatting was incorrect. Evidently, the Kaypro terminal is not set to emulate the ADM31, so the data contains random characters. In a word processing file, the extra characters would drive anyone batty. I understand that an installation program is available to change the terminal emulation; however, since the Osborne format requires no modification, it seems wise to just stick with that.

Running CP/M

Most CP/M computers (including the 128) will check the default disk drive and load the operating system with the push of a key. The 128's auto-load key is the on/off switch. When first activated, the 128 checks device number 8 to see if a CP/M disk is loaded there. If so, it attempts to load the operating system. If not, it leaves the computer at the 128-mode Ready prompt.

To load CP/M after you've turned on your computer without first putting a CP/M disk in the drive, you need only insert a CP/M disk in drive 8 and type BOOT. For regular CP/M users, this command will be easy to remember, since loading CP/M is usually called "booting the system."

Since Commodore computers use Basic, their users are accustomed to typing Load commands from the Ready prompt. CP/M works a little differently. When CP/M has finished loading, you'll see the A> prompt. This means that the system is waiting for a command and that drive A is active. While Commodore computers use device numbers to designate drives, CP/M uses letters. Drive A is set as device 8, drive B as device 9, drive C as device 10, and so on.

As with Commodore computers, CP/M allows you to run a program that is not on the active drive by typing in the drive identifier. Unlike Commodore computers, however, CP/M lets you change the active drive by typing the letter of the drive and a colon and pressing the return key. For instance, B:<return> would make the B drive the active drive. Any commands typed would then affect the B drive. You could still access a program on the A drive by typing an A: in front of the name of the program.

Loading a program with CP/M is done by typing the program's name, which is limited to eight characters. Filenames consist of the program name followed by the three-character extender COM preceded by a period (for example, TYPER.COM). This is the standard format, whether you're dealing with program files or datafiles.

When first loaded, CP/M contains some useful commands—STAT, DIR, TYPE, ERA, REN, SAVE and LOAD—that perform some of the functions of the DOS wedge program distributed with Commodore disk drives.

With the vast library of C-64 and CP/M software available, the C-128 may well have the broadest software base of any personal computer on the market today.

STAT gives the status of any device. DIR gives the directory listing. TYPE prints a file to the screen. ERA erases a file. REN renames a file. The Save and Load commands, although they work somewhat differently than their Basic counterparts, do just what their names imply.

Most beginning users won't need to use these commands nearly as much as they'll need the Format, PIP and Copy programs. Unlike Commodore software, which is increasingly being copy-protected, CP/M software is rarely under lock and key. In fact, most CP/M manuals begin with instructions on how to make a backup copy and the admonition to never use your distribution disks for actual work.

The Format and Copy programs work much like their counterparts in a DOS wedge program. The Format program prepares the disk to receive programs and data; Copy duplicates an entire disk; and PIP (peripheral interchange program) is used to duplicate individual files.

To format disks, you must enter the Format command. The C-128 assumes you want to format using device 8, so it checks to see if device 8 is a 1541 or a 1571. If it's a 1541, you have the options of formatting the disk using Commodore 64 or C-128 CP/M format. If the drive is a 1571, the choice of C-128 double-sided format is added.

Each format makes available a different amount of disk space. The C-64 format disk has 136K of data space available; the 128 format has 170K; the double-sided format has 340K.

To make your format selection, highlight it by using the arrow keys. Next, hitting return displays the instruction to place the disk to be formatted in the A drive. When formatting is complete, you'll be given the opportunity to format another disk. That's all there is to it.

Using the Copy and PIP programs can be bothersome when operating only one disk drive. To emulate a double-disk drive, designate drive E as the place to store the new files, and the program will prompt you to make disk changes when necessary.

For those who have a 1541, though, there's an easier way. Cut the trace to make your 1541 device 9, and use it as a B drive. The second 1541 will be able to read and write C-128 format disks. You can't use double-sided disks with the 1541, however, so you'll have to settle for 170K.

Another alternative is to use the DIP switches in the 1571 to make that the B drive and to use your 1541 as the A drive. This has the advantage of not requiring any hardware modifications, since no traces need to be cut. Using the DIP switches on the back of the 1571 will also allow it to become drive C or D.

Therefore, if you have two 1541s set up as devices 8 and 9, you could easily just add the 1571 to them. You won't, however, be able to take advantage of the 1571's speed when loading the CP/M system, since the system is always loaded off the A drive.

Benefits Galore

The many benefits to having the CP/M capability of the 128 are obvious to anyone familiar with CP/M. Besides the vast library of Commodore 64 software available, you also have access to a wide variety of CP/M applications. With the large number of programs available from the public domain and from electronic bulletin boards, the C-128 may well have the broadest software base of any personal computer on the market today.

The CP/M capabilities of the 128 make it an ideal machine, whether or not you're a programmer. R

Address all author correspondence to Cheryl Peterson, 750 85th St., #3, Miami Beach, FL 33141.

Circle 417 on Reader Service card

commodore

MONITORS DISK DRIVES

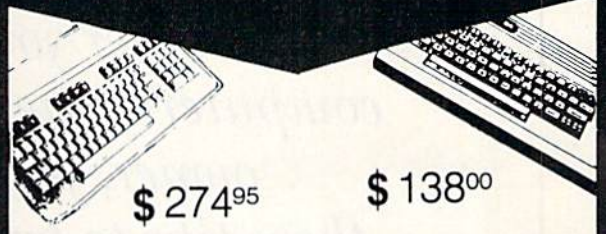
$139 FULL COLOR

NEW UNITS $149.00

RGB and Composite ZENITH CUM-131 for C-128 and C-64

1541 COMMODORE

COMPUTORS



$274.95

$138.00

COMMODORE 128

C64

VIDEO

VCR's HOME DECK VHS $249.00

PORTABLE VIDEO RECORDER $198

CABLE TV

NO PAY TV?

UHF DECODERS, VHF CONVERTERS JERROLD, OAK, SCIENTIFIC, ATLANTA ZENITH

MORE INFORMATION — CALL TODAY

T & D ELECTRONICS

10517 UPTON CIRCLE
BLOOMINGTON, MN 55431

MasterCard VISA

call TOLL FREE

1-800-328-8322 EXT. 581

How to Avoid Computer Disaster

Whether you're a new C-128 computer owner or a long-time C-64 owner, you'll want to heed these tips to prolong the life of your computing system.

By ANNETTE HINSHAW

Computers are frustrating when they don't work. So many things can go wrong in a computer system that almost all computer owners experience problems sooner or later. Whether these problems are disasters or mere annoyances depends on how well you take care of your Commodore equipment.

You know from experience that preventive maintenance and good driving habits keep your car running longer. In the same way, taking care of both hardware and software prolongs the life of your system components. If you form good computer habits, your system will be more fun, more reliable and less expensive. Should your luck fail and your system crash in spite of your care, the disaster is usually limited to manageable proportions.

Most measures that improve the life of your Commodore system are free or inexpensive. They are simple, common-sense operations that anyone can do with only a little extra care and time. In return, you save money, avoid frustration and prevent computer downtime.

This article covers both hardware and software. We'll discuss the enemies of hardware—heat, voltage spikes and dirt—along with some suggestions for preventing, identifying and fixing problems. The things that zap your software are damage to the metal oxide surface of disks or tapes, dirt and EMF (electromagnetic fields).

Computers Like It Cool

When you're copying important disks, does your 1541 or 1571 disk drive ever act strangely or lock up due to overheating?

Computer chips work only within a certain temperature range. When they get too hot, they take a siesta, and the device quits talking to you. If the chips get too hot for a long period of time, they may become permanently damaged.

Fortunately, overheating is easy to control. Don't hide your computer in a closed space or crowd the parts of your system together. Set up your computer so air can flow around it. Never block vents on any of your equipment.

If you must work in a confined space, place a fan so it moves air over your computer, printer and disk drive as they operate. Some computer accessory stores sell small fans that sit on the disk drive and draw out hot air through its vents. I made a paper chimney from poster board and taped it over my disk drive's vent. It draws warm air up and away from the drive and doesn't cost a penny to run.

When my family's equipment gets past the warranty period, we cut out a few of the crossbars in the vent grill

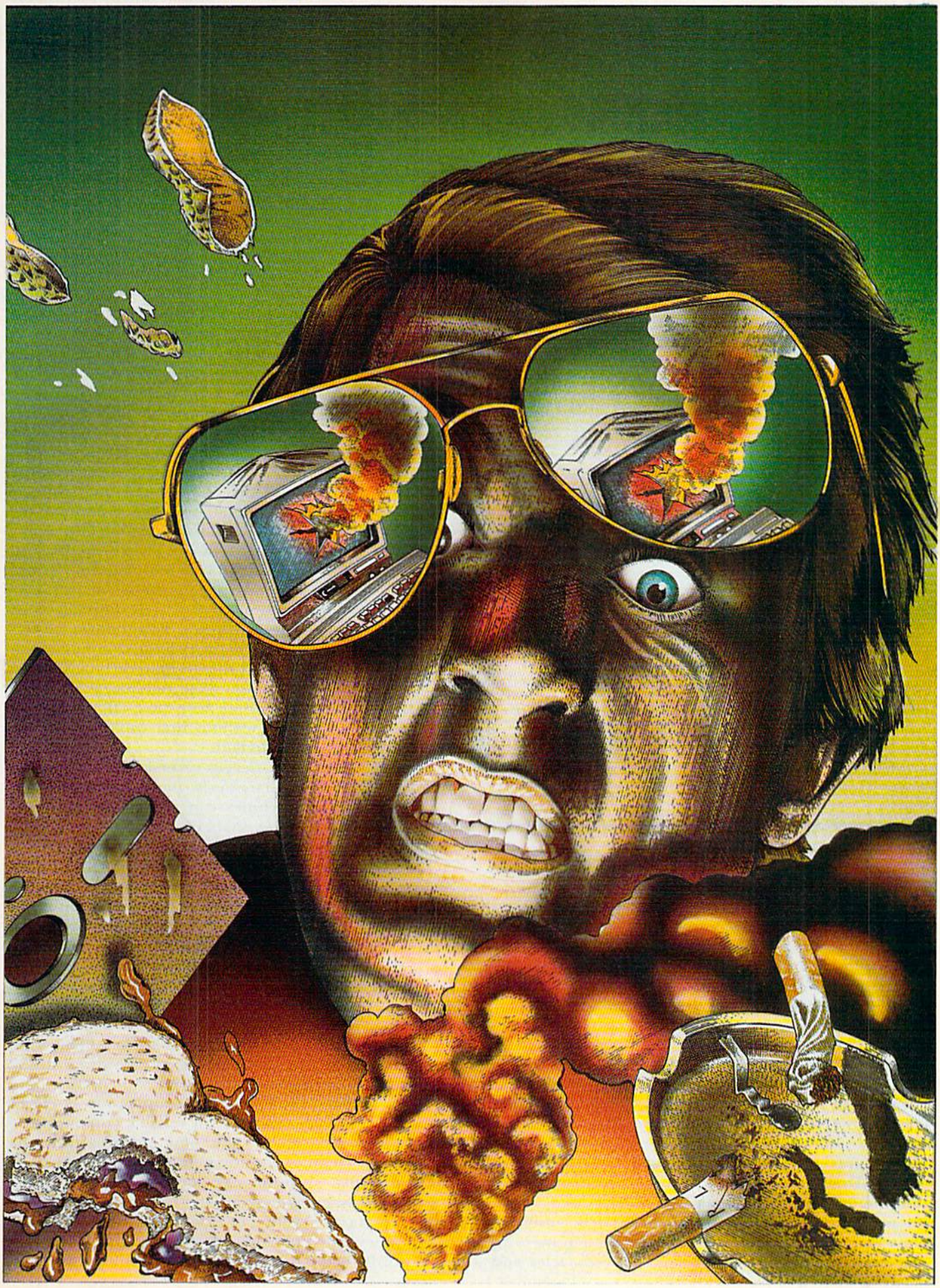


Illustration by Roger Leyonmark

Checklist for Many Happy Returns

Your Commodore computing system will last longer if you:

- ☐ Provide plenty of ventilation for your computer and its peripherals.
- ☐ Use a surge suppressor.
- ☐ Use a power strip.
- ☐ Turn on peripherals before powering-up computer.
- ☐ Keep your computer equipment clean.
- ☐ Don't smoke, eat or drink around your computer system.
- ☐ Keep disk drive heads clean.
- ☐ Keep disks clean. Never place a dirty disk in a disk drive.
- ☐ Keep connector plugs clean.
- ☐ Keep disks away from magnetic sources, temperature extremes and direct sunlight.
- ☐ Keep computer hardware away from windows to prevent exposure to direct sunlight and weather elements.
- ☐ Make backups of your software.
- ☐ Keep computer equipment covered when not in use.
- ☐ Never unplug or turn the power strip off or on while the computer or any peripheral is on.
- ☐ Turn off the computer before disconnecting peripherals.
- ☐ Unplug the power supply when you're not using the computer.

to provide additional ventilation. That mars the appearance of the case, but we have less computer downtime.

Try to place your equipment so air can flow under it. Electronics stores usually sell rubber feet you can attach to the bottom of equipment. We use blocks of scrap wood or cut holes in the desktop or shelf on which the computer or disk drive sits.

If you put rubber feet or wooden blocks under your Commodore, provide support for your modem or anything else that attaches to the user port to prevent strain on the connectors. Don't prop up your computer equipment with metal, which can generate a magnetic field that may destroy data or interfere with your machines.

Overheating that doesn't immediately destroy a chip decreases its life. In the meantime, mysterious, intermittent problems that cause your system to lock up may stop when you improve ventilation around your equipment.

Voltage Spikes Destroy Chips

I give my sick Commodores to Farrell Thrasher of Soft Corps in Tulsa, Oklahoma. He told me that the most common preventable problems he sees in Commodore computers all relate to voltage spikes. He gave me several recommendations.

► Use a surge suppressor. This is a circuit built into a single receptacle or a power strip (box with several receptacles and a power cord) that you place between your equipment and house power outlet. You can buy one for as little as $10 at electronics or computer stores. It diverts line voltage (house power) to ground when the voltage gets too high.

Normal line voltage varies between about 110 and 130 volts. Abnormal conditions, such as a lightning storm, can jump the voltage much higher. We turn off all our computers during storms as an extra precaution. Spikes can happen to anyone. Why take a chance?

► Unplug your power supply (the black box that plugs into the wall). The user's manual advises unplugging the main power supply to your computer whenever the machine is not in use. Thrasher told me that the most frequent power-supply problem he sees comes from not following this advice. Turning off the computer does not turn off the supply. On many Commodores, the power unit fails after a time if it is on continuously. It stops regulating voltage, which could cause one or more of the computer's major chips to burn out.

► Use a power strip with its own switch and fuse to isolate your entire system from the wall. This arrangement also effectively unplugs your power supply. Power-down procedure is to turn off the computer, then the peripherals that are plugged into the power strip, and finally the power strip itself. *Never* turn off your power strip without first turning off your equipment.

Power-up reverses the process. Simultaneously powering up several machines can cause a brief power surge that, electronically speaking, hammers on your machines. I lost a C-64 to this practice myself.

Surge suppressors and power conditioners range in price from a few dollars to very expensive. Unless you can't be without your Commodore, due to business or some other activity, the expensive units are probably not cost effective. Spending $100 on a power conditioner to protect a machine you repair for less than $100 is not economical. However, a $30 power strip with switch, fuse and built-in surge suppression is cheap insurance for reliable computing.

► Never unplug anything from the expansion port (game cartridge port) or the user port (modem port) while your computer is turned on. Arrange your power cords, cables and other plug-ins so you can't trip over them and accidentally unplug the com-

puter. (We killed our first VIC by accidentally disconnecting the modem with the power on.) Don't plug in a printer or disk drive, either at the computer or the peripheral, while the peripheral is turned on. You can plug into the joystick port with the computer on.

► Make sure all plugs are firmly seated and have no pressure on the plug. For example, the weight of your printer interface hanging from the printer stresses the plug. A plug that is in crooked may make poor contact or cause a short (an unwanted connection). Shorts are almost always disastrous.

Good electrical practices sound obvious, but Thrasher tells me he regularly sees computers that died because someone unplugged a cartridge with the power on. The chips in your computer use very little power. That also means they are very sensitive to relatively small changes in power. Don't take chances.

Cleanliness Is Next to Reliability

Dirt is an enemy of both hardware and software. On hardware, normal dust and tarnishing prevent good contacts and reliable operation on plugs, cartridges and keys. Particles of tobacco smoke or tiny fragments of metal oxide from tapes and disks can keep your drives from accurately loading and saving programs. You can't build a "clean" room in your home just to keep your Commodore running, but you can take steps to hold back the tide.

Don't keep your C-64 or C-128 in the kitchen where greasy smoke and steam can affect it. Be very careful if you eat, drink or smoke around your computer. Crumbs on the keyboard can filter down and cause some of your keys to operate erratically. Spilled drinks can cause shorts in the electronics. (Placing a sheet of Saran Wrap over your keys might be effective protection in keeping out foreign elements.)

If you spill even plain water on a disk, the disk is no longer reliable. Never touch the magnetic surface on a tape or disk. Today's thumbprint can destroy tomorrow's data. Tobacco smoke can leave particles on the drive heads or on your disks and cause problems that may not surface for days.

Clean read/write heads occasionally. Cleaning heads is usually more important for tape drives than disk drives, especially if you use inexpensive tapes. I don't like head-cleaning cassettes because they are abrasive. For less than $2, Radio Shack has a cassette-head cleaning kit that includes an alcohol cleaner, a head lubricant and some cotton swabs. If you have a tape drive, it's the best bargain in town. Ask someone to show you how to clean the heads if you've never done it. We clean tape heads about every four hours of run time or when we get two Load or Verify errors in a row.

Commodore disk heads are epoxied and don't need cleaning often unless you use "flippies" (disks notched and turned over to record on the back) or a disk disintegrates. Thrasher recommends taking the drive apart once in a while and gently cleaning the head with alcohol and a cotton swab. Dampen rather than soak the swab. (For an explanation on how to clean your drive head, see "Keep It Clean," p. 50, *RUN*, July 1985.)

If you are uncomfortable about taking the machine apart, you can buy a commercial disk-head cleaning kit. I recommend a wet cleaner instead of a dry one, because the latter is abrasive. Radio Shack has one for $14.95. Follow the instructions and use the Initialize disk command several times to run the head over the cleaning disk.

I prefer the kit from Nortronics (8101 Tenth Avenue North, Minneapolis, MN 55427), but it costs $39.95. It comes with software that gives you step-by-step instructions, and it runs the drive the right amount of time to clean the heads thoroughly. It also has refillable disk covers for the cleaning disks and comes packaged in a nifty 15-disk storage box.

Clean the plugs in the expansion, user and cassette ports with the power off. The contacts on the connectors tarnish in time. Alcohol on a swab works fine. Be sure you don't leave particles of cotton behind, or they'll make new problems. Your cartridges and other plug-ins work better without the corrosion. The contacts on the keys are fairly easy to clean, if you are confident enough to take the keyboard apart.

If you suddenly have trouble loading programs that have been working fine, try cleaning the read/write heads and connectors before you assume you have an alignment problem.

Software Needs Special Handling

Physically, disks are fragile. While tape is not quite so fragile, everything I say about disks also applies to tape. The metal oxide on the disk surface reacts to electromagnetic signals; this is how the disk saves information. If you damage the surface, the disk won't read or write reliably in the damaged area. Sometimes weeks go by before you discover a problem. If you write on a disk with a ballpoint pen, you may not suffer for your carelessness for quite a while. Generally, anything that puts pressure on the disk surface may damage it.

The biggest enemy of your software is uncontrolled radiation, especially electromagnetic radiation (EMR) from a motor or TV tube. Never store your disks, even for a moment, near a motor. Keep them away from refrigerators, stereos, your disk drive and the vacuum cleaner. Avoid cathode-ray tubes.

Your TV or monitor can be lethal to disks. Keep disks away from the telephone; the ringer or the magnets in the handset can zap a disk to unreadability with one ring. Metallic objects, such as screwdrivers, can develop enough magnetism to damage software. Don't store them around your computer work area. Small permanent magnets and coiled electric cords are also dangerous. Don't leave disks in the drive when you turn the power on or off.

Heat and light are also forms of radiation that can harm your disks. Don't leave your magnetic media in the sun or in the trunk of your car on a hot day. Disks are sensitive to extremes of both heat and cold. Enough heat might change information stored on the disk. Cold can shrink the disk material enough to change the location of data. If your disks have been exposed to temperature extremes, wait at least a day before you use them, so they can return to normal.

Store your disks upright in moderate temperatures, protected from light and dust. Store them away from motors, electric cables and other magnetic-field sources. Store your backups somewhere removed from your working disks.

Speaking of backups, backing up data and program disks is the single most important protection against disaster. Can you afford to be without a program for the time it takes to replace it, possibly from the manufacturer?

Develop a personal backup policy and stick to it. You may not be able

to copy-protect software, but you can choose to buy programs that can be backed up or easily replaced. Don't take a chance with data disks for applications like word processing, spreadsheets or databases. Each disk represents hours of your time, even if you can recover the data. I strongly advise that you make frequent backup copies. You're really gambling if you back up your data only infrequently.

Identifying Problems

Sooner or later, you will have computer problems. They may be small and irregular, such as Load errors, problems in saving or reading data and system lockups. Such problems may not be more than momentary glitches from heat or drops and rises in voltage. Your equipment may be fine.

On the sad day you decide you are having regular problems, the first thing to do is identify the source. If your Commodore doesn't come on (the red power indicator will be out), open the case and check the fuses. If the filament in a fuse is broken, replace the 1½-amp fuse and see if that cures the problem. Otherwise, your computer will need professional help.

Deciding what's wrong is not always easy. The same apparent symptoms can happen because of bad software, a misaligned drive or a bad chip in the computer. A good first step is to keep a diary of your problems. Record, as closely as you can, the disk, the program, the time of day, the date and exactly what you did just before your problem occurred. You may eventually find a pattern. Record lockups of the computer or disk drive, loading problems and disk errors and system resets. You will know if the system has reset if you see the initial display screen and lose your program.

The system reset is the easiest to diagnose; it occurs when power to the computer is interrupted, and you lose whatever was in your computer. It could result from a momentary lapse in your house power. Garbage may be written to the disk, thus damaging your software. However, your system as a whole is probably all right. If this reset happens regularly, double-check to see that all your plugs are firmly connected. Also, check to see that your house wiring is sound. If the computer resets several times in a few minutes, it has lost its voltage regulation. Turn it off and take it and its power supply to a specialist.

Computer malfunctions are due to operator error, software failure, hardware failure or all of the preceding.

Operator error happens to even the most experienced computerists. Computer systems are so complex that you can easily hit the wrong series of keys and lock up the computer. Errors like unplugging cartridges at the wrong time or removing a disk when the drive is running can harm your system, but hitting the wrong keys shouldn't damage anything.

The log I suggested will help you find what, if anything, you are doing wrong. Find a user's group so you can ask more experienced people for help and advice. As you become more acquainted with your system, problems caused by your mistakes will decrease.

Software failure can result from physical or electrical damage or wear on a frequently used disk. Your problem log is the easiest way to identify a bad disk or a bad program, because you only have problems when you use them. Thrasher told me he often gets drives in for repair that are perfectly all right; the problem lies in the software.

If you suspect software failure, try a backup disk if you or a friend has one. Also, try your disk in a friend's drive. The idea is to eliminate the variables. When problems are confined to a single program, try saving it to another part of the disk, if you can load it. People at a user's group meeting may have other suggestions. When your problems occur only in one routine of a particular program, the software may contain bugs. Write the manufacturer for help.

Identifying which piece of hardware is in trouble works the same way as swapping disks and disk drives. If possible, take your whole system to the home of someone whose system works. Try your drive with his computer, your computer with his drive, and so on, until you duplicate your problem and find out what hardware needs repair. Hardware swapping is fairly safe, with one exception. If you suspect that your power supply is bad, don't use it on a friend's system. A bad supply might damage chips in his computer.

Let me say a word about diagnostics. You can buy programs that check the major chips and ports in your computer or the alignment on your disk drive. For the accomplished do-it-yourselfer, these programs are valuable for alerting you to problems, but they're not cost-effective unless you have a lot of technical skill.

Where to Get Your System Fixed

The best way to find reliable repair services is through the combined resources of a user's group. Other users share their experiences with repairs, and savvy repairmen who work on Commodores advertise in newsletters and interact with user's groups. Don't give your computer or disk drive to people who don't have Commodore experience. Repair documentation from Commodore does not always reflect changes in the printed circuit board, and getting repair parts is difficult for anyone not already working with the company.

If you can't find a local technician, call Commodore at 215-436-4200 to find out where your local Commodore service center is located, or consult the service center list in the July, August, September and November issues of *RUN*.

When you damage commercial software, check the user's manual that came with it. The manufacturer may replace a blown disk for much less than the cost of brand new software. The manufacturer may also offer support services to recover data disks or remove bugs. Always register your software, so the publisher can find you if the company issues an update or recalls buggy programs. One of the best and most self-interested reasons to avoid pirated software is that you can't ask for help if you need it.

Postscript

When cars first came out, dealing with inevitable machine failures was traumatic. After decades of car use, breakdowns are still a pain, but we've learned to control them and deal with maintenance and repairs. You need only realize that computers are just another kind of machinery and set out to learn the rules of keeping them running, and many of the hassles of living in the computer age will drop away. R

Address all author correspondence to Annette Hinshaw, PO Box 580635, Tulsa, OK 74158.

THE X-10 POWERHOUSE DOES EVERYTHING BUT PUT OUT THE CAT.

Model CP290

THE X-10 POWERHOUSE INTERFACES WITH YOUR COMMODORE TO CONTROL YOUR HOME...FOR SECURITY, COMFORT AND ENERGY SAVINGS.

This remarkable Interface lets you run your home through your Commodore 64 or 128 and a keyboard or joystick.

When you're away, it makes your home look and sound lived in. When you're home, it can turn off the TV at night and wake you up to stereo and fresh brewed coffee in the morning. It can even turn on your air conditioner and control your heating.

SPECIAL COLOR GRAPHICS MAKE PROGRAMMING A SNAP. You simply pick a room from the display screen. Use your keyboard or joystick to position graphics of lights or appliances. Then follow on-screen instructions to program any light or appliance to go on or off whenever you choose. You can even control thermostats, light intensity and more.

THE WAY IT WORKS. The X-10 Powerhouse Interface is cable-connected to the Commodore "User" port and plugged into a standard 110V outlet. After it is programmed, the Interface sends digitally encoded signals through your home wiring to special X-10 Modules. To control a lamp or appliance, you simply plug the electrical device into a Module

and then plug the Module into an outlet. The Interface can control up to 256 Modules throughout your home and won't interfere with normal use of lights and appliances.

There are plug-in Appliance Modules, Lamp Modules, Wall Switch Replacement Modules and Special 220V Modules for heavy duty appliances such as water heaters and room air conditioners. Plus Thermostat Controllers for central heating and air conditioning, Telephone Responders to control your home from any phone, and much more.

IT WON'T TIE UP YOUR COMPUTER. Use your computer only for programming. When you're finished, disconnect the Interface from the "User" or RS-232 port and keep it plugged into any convenient power outlet in your home. It will operate as a stand-alone controller with battery back-up and will run your home automatically.

SURPRISINGLY INEXPENSIVE. A Powerhouse System including the Interface, software and connecting cables costs less than $150. X-10 Modules are less than $20 each.

For the Dealer Nearest You Call: 1-800 526-0027
[in NJ: (201) 784-9700]
or, write to: X-10 (USA)
185A Legrand Avenue
Northvale, NJ 07647

X-10 POWERHOUSE
NUMBER ONE IN HOME CONTROL

Commodore 64 and Commodore 128 are registered trademarks of Commodore Int'l Ltd.

Circle 400 on Reader Service card.

Definitions & Demonstrations

C-64/C-128 Terms Explained

By MARGARET MORABITO

Is your head spinning from trying to distinguish between Basic 2.0 and Basic 7.0 commands? Well, here's a comprehensive list of C-64 and C-128 commands, statements, functions and reserved variables that is sure to set you straight. Also included are examples of how you may use them for programming.

The following glossary includes all of the C-128's Basic commands, statements, functions and reserved variables. Among these are the Basic 2.0 commands from the 64 mode and the Basic 7.0 commands from the 128 mode.

Each word is described and illustrated either with the actual syntax (form to follow), an example (in Immediate mode or in Programming mode) or both. Some parameters are optional within the syntax of certain terms. Optional parameters are placed within brackets, [ ]. In places, there are two ways of entering the same parameter. For instance, when you see <ON,>, you may either enter ON or just the comma. These parameters always exist within inequality signs, < >.

If you're trying to learn Basic, you'll find typing in the programming examples to be helpful. The graphics commands, for example, hold programming lines that can be combined into a useful demo program. An asterisk to the left of a term indicates that it is only active in 128 mode. Each term is directly followed, in brackets, by its abbreviation.

ABS [A Shift B]. This numeric function returns the absolute value of a number. All negative numbers are translated into positive.

Syntax: ABS(X)

Example: PRINT ABS(−3.587)
3.587

AND [A Shift N]. This logical operator lets the computer calculate the truth of several logical expressions. It is also used to turn off selected bits.

Example: IF X<5 AND X>10 THEN GOTO 100

***APPEND [A Shift P].** This command opens an existing sequential file on disk and sets the pointer at the end of the file, so that subsequent Print# (write) statements will append new data to the end of the old file.

Syntax: APPEND #Logical file number,"FileName"[,Ddrive number][<ON,>Udevice number]

Examples: APPEND #8,"SAMPLE FILE"

This prepares "Sample File" for receiving new data.

APPEND #1,"ANOTHER FILE",D0,U9

This prepares "Another File" on drive 0, device 9, for receiving additional data.

ASC [A Shift S]. This numeric function returns the Commodore ASCII value (0–255) of the first character of a string.

Syntax: ASC(N$)

Example: N$ = "RUN"
PRINT ASC(N$)
82

ATN [A Shift T]. This numeric function returns an angle (measured in radians) that has the tangent (N).

Syntax: ATN(N)

Example: N = 9
PRINT ATN(N)
1.46013911

***AUTO [A Shift U].** This command turns on and off automatic line numbering. After entering a line of Basic, press the return key, and the next line number will be displayed.

Syntax: AUTO [Line#]

Examples: AUTO 10

This sets the program's line numbers in increments of 10, starting at the first line number that you type in for your program.

AUTO

Without a number, AUTO turns off the line-numbering feature.

***BACKUP [BA Shift C].** Used with a dual disk drive, this command will copy the entire contents of one disk to another.

Syntax: BACKUP D Source drive TO D Destination drive[<ON,>Udevice]

Examples: BACKUP D0 to D1

This copies all files from the disk in drive 0 onto the disk in drive 1. For use on dual drive unit 8.

```
BACKUP D0 to D1,U9
```

Same as above, but for use on dual drive unit 9.

***BANK [B Shift A].** This statement designates one of 16 memory banks within the C-128. The default bank is 15. Type BANK N (0–15) from within Basic to switch banks.

Syntax: BANK number

***BEGIN/BEND [B Shift E/BE Shift N].** This is a conditional statement that is structured to allow for including several programming statements.

```
Example:    5 INPUT Y
           10 IF Y = 5 THEN BEGIN:PRINT
              "Y IS 5."
           20 PRINT "BECAUSE Y IS 5,
              THE STATEMENTS UNTIL
              BEND WILL BE EXECUTED."
           30 BEND:PRINT "THE BEGIN/
              BEND STRUCTURE HAS
              BEEN FULFILLED.":GOTO
              100
           40 PRINT"Y DID NOT EQUAL
              5, SO THE PROGRAM
              BRANCHED AROUND THE
              BEGIN/BEND STRUCTURE."
              :GOTO 100
          100 PRINT"THE END OF THIS
              SAMPLE."
```

***BLOAD [B Shift L].** This command loads a binary file (program or data) into a specified location in memory. The binary file is a file that has been previously saved from the machine language monitor or from within Basic using BSAVE.

Syntax: BLOAD"Filename"[,Ddrive number][,Udevice number][,Bbank number][,Pstart address]

Example: BLOAD "SPRITE",D0,U9,B1,P4096

This loads the data for "Sprite" from drive 0, unit 9, into bank 1 at the starting location of 4096 in memory.

***BOOT [B Shift O].** This command loads and executes a machine language program from disk, beginning at the predefined starting address.

Syntax: BOOT"Filename"[,Ddrive number][<ON,>Udevice number]

Examples: BOOT

This will search for an executable machine language program on drive 0, unit 8. Then it will load and run that program automatically.

```
BOOT "MUSIC SAMPLE",D1,U9
```

This will load and run "Music Sample" from drive 1 on unit 9.

***BOX [none].** This graphics statement is used for drawing any sized rectangle or a filled polygon.

Syntax: BOX[Color source],X1,Y1[,X2,Y2][,Angle][,Paint]

Color source can be 0–3 (0 = background; 1 = foreground; 2 = multicolor 1; 3 = multicolor 2).

X1 and Y1 are the top-left coordinates; X2 and Y2 are the bottom-right coordinates; Angle is the amount of the object's clockwise rotation in degrees (this is based on the center point of the rectangle); Paint is used to designate whether to fill the shape in (1) or leave it empty (0).

```
Example: 10 GRAPHIC 1,1
         20 BOX 1,25,25,100,100
```

This draws an unfilled rectangle.

***BSAVE [B Shift S].** This command is similar to BLOAD, but it's used for saving binary files to disk. When using BSAVE, you specify the starting and ending addresses in memory.

Syntax: BSAVE"Filename"[,Ddrive number][,Udevice number][,Bbank number],Pstart addressTOPending address

Example: BSAVE "SPRITE", B0,P3584 TO P4096

***BUMP [B Shift U].** This function determines which sprites have collided since the last check.

Syntax: BUMP (N)

N is a number between 0 and 7, corresponding to sprites 1 through 8.

***CATALOG [C Shift A].** This command will read and display the disk directory without disturbing any programs in memory.

Syntax: CATALOG[Ddrive number][<ON,>Udevice number][,wildcard string]

Example: CATALOG

(Default drive 0 on device 8.)

***CHAR [CH Shift A].** This statement displays a character on the screen, whether in Bit-mapped mode or in Text mode.

Syntax: CHAR[Color source],X,Y[,"STRING"][,Reverse flag]

Reverse flag:0 = off/1 = on

Example: 30 CHAR 0,2,20,"SAMPLE TEXT",1

This will print the words "Sample Text" at column 2, row 20, with a reversed background.

CHR$ [C Shift H]. This string function returns the string character of a Commodore ASCII code number.

Syntax: CHR$(X)

Example: PRINT CHR$(74)
J

***CIRCLE [C Shift I].** This statement is used for drawing circles, ellipses, arcs, triangles, octagons and other polygons.

Syntax: CIRCLE[Color source],X,Y[,XR][,YR][,SA][,EA][,Angle][,Inc]

See BOX for description of color source. X,Y is the center point of the circle; XR,YR are radii; SA is the starting angle; EA is the ending arc angle; Angle is the rotation in degrees clockwise; Inc is the increment in degrees between line segments.

```
Example: 40 CIRCLE1,150,100,55,10
         50 CIRCLE1,75,45,25,18
```

CLOSE [CL Shift O]. This statement closes a file that was opened with OPEN or DOPEN.

Example: CLOSE15

This closes file number 15.

CLR [C Shift L]. While leaving a program untouched, this statement clears the variables in memory.

Example: CLR

CMD [C Shift M]. This command redirects screen output to another device, such as a disk drive or a printer.

```
Example: OPEN 4,4
         CMD4:LIST
         PRINT#4
         CLOSE4
```

This redirects output to the printer while a program listing is being made.

***COLLECT [COLL Shift E].** This command frees up disk space that has been allocated to improperly closed files. It also deletes references to those files from the directory.

Syntax: COLLECT [Ddrive number][<ON,>Udevice]

Example: COLLECT D0

***COLLISION [COL Shift L].** This statement detects sprite collisions and specifies an action to be taken subsequent to that collision. Usually, the action is a branch to a predefined subroutine.

Syntax: COLLISION type[,statement]

Types: 1 = sprite-to-sprite
2 = sprite-to-display
3 = light pen (40-column mode).

Statement: The line number of a subroutine in Basic.

Example: COLLISION 1500

***COLOR [COL Shift O].** This statement assigns colors to one of the seven screen color areas on the C-128. Sixteen different colors can be used.

Syntax: COLOR Source number, Color number

Sources are: 0 = 40-column background; 1 = 40-column foreground (graphics); 2 = multicolor 1; 3 = multicolor 2; 4 = 40-column border (text or graphics); 5 = character color in 40/80 columns (text); 6 = 80-column background.

Colors are 1 to 16.

Example: 5 COLOR 0,5

This colors the background light-purple in 40-column mode.

***CONCAT [C Shift O].** This command merges, or concatenates, two sequential datafiles that already exist on disk.

Syntax: CONCAT"Second file"[,Ddrive number]TO "First file"[,Ddrive number] [<ON,> Udevice number]

Example: CONCAT"FILE 2", D0 TO "FILE 1",D1

This will merge files 1 and 2, placing FILE 2 at the end of FILE 1, while retaining the FILE 1 name.

CONT [64:C Shift O/128:none]. This command restarts program execution after it has been halted by STOP or END, and resumes where the break occurred.

Example: CONT

***COPY [CO Shift P].** This command copies a single file or all files from one disk to another. It is also used in single-drive systems for making a copy onto the same disk, but under a different name.

Syntax: COPY[Ddrive number,]"Source filename" TO [Ddrive number,] "Destination filename"[<ON,> Udevice number]

Example: COPY D0,"SOURCE FILE" TO D1, "DESTINATION FILE"

This copies the Source file from the disk in drive 0 to the disk in drive 1 and also renames the file as Destination file.

COS [none]. This function returns the cosine for an angle specified in radians.

Example: PRINT COS(N)

DATA [D Shift A]. This statement defines the data that is to be input into memory by a Read statement. Numbers and words can be placed in a Data statement. All items must be separated by commas. Words must be placed within quotation marks. Data statements can be located anywhere in a Basic program. See Restore.

Example: 100 DATA 12,"Ralph",01345,"NY"

***DCLEAR [DCL Shift E].** A command that closes and clears all open channels on a specific disk drive and device number. This is similar to OPEN 15,8,15,"I0":CLOSE15

Syntax: DCLEAR[Ddrive number][<ON,> Udevice]

Example: DCLEAR D0

***DCLOSE [D Shift C].** This command closes one or all files that are open on a disk drive.

Syntax: DCLOSE[#Logical file number] [<ON,>Udevice number]

Example: DCLOSE

***DEC [none].** This numeric function calculates the decimal value of a hexadecimal string.

Example: PRINT DEC("FF00")
65280

DEF FN [64:D Shift E/128:none]. This is the Define Function. It lets you define special-purpose formulas that will be used frequently within a Basic program.

Syntax: DEF FN name(variable) = expression

Example: 5 DEF FNC (X) = 3.14159265*r12

In this sample, the name of the function is FNC. X is a dummy numeric variable. The expression after the equals sign is the formula for calculating the area of a circle.

***DELETE [DE Shift L].** This command deletes lines from a Basic program.

Syntax: DELETE[First line][-Last line]

Example: DELETE 10-70

This deletes lines 10 through 70.

DIM [D Shift I]. This Dimension statement reserves memory space for array variables. It also defines an array as having one or more dimensions to it. All arrays having more than 11 items must be dimensioned with DIM.

Example: DIM X(20)

This defines a one-dimensional array named X to accommodate 21 items.

***DIRECTORY [DI Shift R].** The F3 key on the C-128 is predefined to display the disk directory for drive 0, device 8. Any drive's directory can be viewed using this command.

Syntax: DIRECTORY[Ddrive number][<ON,> Udevice number][,"Wildcard"]

Example: DIRECTORY D1,U9

***DLOAD [D Shift L].** A command that loads a Basic program from disk.

Syntax: DLOAD"Filename"[,Ddrive number] [,Udevice number]

Example: DLOAD "MEMO"

***DO/LOOP/WHILE/UNTIL/EXIT [none/LO Shift O/W Shift H/U Shift N/EX Shift I].** The Do/Loop statement is a looping technique similar to For/Next. All statements between the DO and the LOOP in a program are continuously executed unless WHILE, UNTIL or EXIT are encountered.

If the Exit statement is encountered, program execution passes to the statement following the Loop statement. If the Until statement is encountered, the program loops until a condition is met. The While statement is the opposite of Until: The program continues while a certain condition is true. When the condition becomes false, program execution passes to the statement following the Loop statement.

```
Example:  5 Y = 15
         10 DO UNTIL Y = 30
         15 Y = Y + 1: PRINT Y
         20 LOOP
         30 PRINT "THIS LOOP ENDED
            WHEN Y BECAME 30."
```

***DOPEN [D Shift O].** This command opens a disk file (sequential, relative or random access) for reading and/or writing.

Syntax: DOPEN#Logical file number, "Filename[,<S/P>]"[,Lrecord length][,Ddrive number][<ON,>Udevice number][,W]

S = Sequential file; P = Program file; L = Record length in a relative file; W = Write operation.

Example: DOPEN#1,"CHECKS"

This opens a sequential file number 1, named Checks, for read access.

***DRAW [D Shift R].** This graphics statement is used for drawing dots, lines and other shapes on screen.

Syntax: DRAW[Color source],X1,Y1 [TO X2,Y2]...

X1 and Y1 are starting coordinates from 0,0 to 320,220, and X2 and Y2 are ending coordinates.

Example: 60 DRAW 1,120,120 TO 300,120

DS and DS$ [none/none]. These system variables are used for reading the disk drive command channel after an error has occurred. DS returns the status of the drive's command channel to find the cause of an error. DS$ defines the error in words.

Example: PRINT DS$

***DSAVE [D Shift S].** This command saves a Basic program to disk. Function key 5 activates this command.

Syntax: DSAVE"Program name"[,Ddrive number][<ON,>Udevice number]

Example: DSAVE"MY PROGRAM"

***DVERIFY [D Shift V].** This command checks a program on a specified disk drive against a program in memory.

Syntax: DVERIFY"Filename"[,Ddrive number][<ON,>Udevice number]

Example: DVERIFY "My Program"

***EL [none].** This system variable is used for error trapping. EL will identify the line in which an error has occurred.

END [64:E Shift N/128:none]. This statement stops a program's execution and returns the computer to Immediate mode.

***ENVELOPE [E Shift N].** This statement is used to define a musical instrument by setting the envelope number(N), attack rate(A), decay rate(D), sustain(S), release(R), waveform(WF) and pulse width(PW).

Syntax: ENVELOPE N[,A][,D][,S][,R][,WF][,PW]

N = 0–9/A = 0–15/D = 0–15/S = 0–15/R = 0–15/WF:0 = triangle; 1 = sawtooth;2 = variable pulse (square); 3 = noise;4 = ring modulation/PW = 0–4095.

***ER [none].** This system variable used in error-trapping holds the definition of the most recent error encountered.

***ERR$ [E Shift R].** This function is used for reading an error message from an error encountered in a Basic program.

Example: PRINT ERR$ (ER)

***EXIT.** (See DO/LOOP/WHILE/UNTIL/EXIT).

EXP [E Shift X]. This numeric function calculates the mathematical constant e (2.7182813) to an indicated power of N.

Syntax: EXP(N)

***FAST [none].** This command puts the C-128 into 2 MHz mode of operation for speedier operations. This turns off the 40-column screen until the Slow command is given.

***FETCH [F Shift E].** This statement is used for getting data from the RAM expansion module on the C-128.

Syntax: FETCH #Bytes, Start of Host RAM, Expansion Bank, Start of Expansion RAM.

***FILTER [F Shift I].** A music statement for programming the SID chip's various filters.

Syntax: FILTER [Frequency] [,Low Pass][,Band Pass][,High Pass][,Resonance]

FN. (See DEF FN).

FOR/TO/STEP/NEXT [F Shift O/none/ST Shift E/N Shift E]. A looping statement structure that is used to count the number of times a portion of a Basic program is executed.

```
Example: 10 FOR T = 1 TO 100 STEP 5
         20 PRINT T
         30 NEXT T
```

FRE [F Shift R]. This numeric function computes the number of free bytes available for Basic programs (N = 0) and Basic variable storage (N = 1).

Example: PRINT FRE(0)

GET [G Shift E]. A programming statement that sends one character at a time from the keyboard to memory whenever a key is pressed. If a key is not pressed, then the program will continue execution automatically.

***GETKEY [GETK Shift E].** This statement receives input data from the keyboard one character at a time. It waits for the user to type a character before letting the program continue execution.

Example: 10 GETKEY N$

GET# [none]. This statement requests data, one character at a time, from a tape, disk or the RS-232 port. A file has to have been opened.

Example: 10 GET#15,N$

GO [none]. This dummy statement is always used with TO. GO and TO are usually combined into a one-word statement: GOTO. (See GOTO.)

***GO64 [none].** This command is used for accessing 64 mode from 128 mode on the C-128.

```
Example: GO64 <RETURN>
         Are you sure?
```

GOSUB/RETURN [GO Shift S/RE Shift T]. This statement calls for execution of a subroutine that appears in another location within a Basic program. Once the subroutine has been completed, program execution returns to the line following the Gosub statement.

```
Example: 10 GOSUB 300
         20 PRINT "THIS IS WHERE
            THE PROGRAM CONTIN-
            UES AFTER THE GOSUB
            ROUTINE HAS FINISHED"
         30 :
         40 END
        300 PRINT"HERE IS THE SUB-
            ROUTINE.":RETURN
```

GOTO [G Shift O]. This statement transfers program execution to the line number specified.

Example: 10 IF X = 1 THEN GOTO 50

***GRAPHIC [G Shift R].** This statement puts the C-128 into one of six graphics modes.

Syntax: GRAPHIC Mode[,Clear][,S] or GRAPHIC CLR

The six graphics modes are: 0 = 40-column text; 1 = standard bit-mapped; 2 = standard bit-mapped split-screen; 3 = multicolor bit-mapped; 4 = multicolor bit-mapped split-screen; 5 = 80-column text. Clear can be set to 1 for clearing the screen. S indicates the starting line number in Split-screen mode.

Example: 10 GRAPHIC 1,1

This activates the standard bit-mapped graphics mode and clears the screen.

***GSHAPE** (See SSHAPE).

***HEADER** [HE Shift A]. This command is for formatting a disk.

Syntax: HEADER"Diskname"[,Ii.d.number][,Ddrive number][<ON,>Udevice number]

***HELP [none].** This command is available for use when a Basic programming error has occurred. HELP will list the erred line and highlight the line segment where the error happened.

***HEX$ [H Shift E].** This function displays a four character hexadecimal number from a decimal number.

Syntax: HEX$(N)

***IF/THEN/ELSE [none/none/none].** This statement evaluates a Basic expression and takes one of two actions. When the If expression is true, the Then statement is executed. When the If expression is false, then program execution falls to the next line number, unless an Else clause is present. When an Else clause is present on the same line as the If/Then, it is executed when the If expression is false.

Syntax: IF <expression> THEN <statement>:[ELSE clause]

```
Example:  5 INPUT Y
         10 IF Y=5 THEN GOTO 20:
            ELSE GOTO 5
         20 PRINT "Y IS 5."
```

INPUT [none]. This statement asks the user to type in specific information. The program displays a question mark on screen, then waits for the user to enter a response and press the return key.

```
Example:  5 INPUT "GUESS A NUMBER
            BETWEEN 1 AND 10.";N
         10 IF N=3 THEN PRINT"YOU
            GUESSED IT!":GOTO 20
         15 PRINT" NO. TRY AGAIN.":
            GOTO 5
         20 END
```

INPUT#. This Input statement gets its information from a disk or tape file rather than from the user. The information is then used in a Basic program.

```
Example:  5 OPEN 15,8,15
         10 FOR T=1 TO 25
         20 INPUT#15,A$,X,B$
         30 NEXT T
         40 CLOSE 15
```

***INSTR [IN Shift S].** This function will search for the location of a string within another string and display the numeric value of its starting position.

```
Example: PRINT INSTR("WHERE IS IT?","IS")
          7
```

INT [none]. This numeric function converts a numeric expression to the nearest whole number, which is less than or equal to the expression. INT displays the integer value.

```
Example: PRINT INT(2.156)
          2
```

***JOY [J Shift O].** This function displays the position of a joystick and the status of the fire-button.

```
Example: JOY(2)=129
```

***KEY [K Shift E].** This statement is used to define the purposes of the eight function keys.

```
Syntax: KEY [key number,string]

Example: KEY 1,"OPEN4,4:CMD4:LIST" +
          CHR$(13)
```

This defines F1 to list to the printer the current Basic program in memory.

LEFT$ [LE Shift F]. Left string is a function that returns a specified number of the leftmost characters of a string.

```
Example: 10 X$="WHAT IS IT?"
         20 PRINT LEFT$(X$,4)
         RUN
         WHAT
```

LEN [none]. This function determines the length of a string.

```
Example: X$="RUN MAGAZINE"
         PRINT LEN(X$)
          12
```

LET [L Shift E]. This is an optional statement used for defining a variable.

```
Example: LETX=100
```

This could be written X=100.

LIST [L Shift I]. This command will display on the screen all of the statements in a Basic program or those specified by the user.

```
Syntax: LIST [First line][-Last line]

Example: List 10-40
```

LOAD [L Shift O]. This command is used for loading programs from either tape or disk.

```
Syntax: LOAD "Program"[,Device number]
  [,Relocate flag]

Examples: LOAD "DISK PROGRAM",8
          LOAD "TAPE PROGRAM"
```

***LOCATE X,Y [LO Shift C].** A graphics command that lets the user place the pixel cursor anywhere on a high-resolution screen. X and Y coordinates can range from 0,0 to 320,200.

```
Example: LOCATE 100,100
```

LOG [none]. This function returns the natural logarithm of a positive number.

```
Syntax: LOG(X)
```

LOOP. (See DO/LOOP/WHILE/UNTIL/EXIT)

MID$ [M Shift I]. MID String is a function that locates a substring within a larger string by specifying its starting position and length.

```
Example: X$="RUN IT RIGHT"
         PRINT MID$(X$,5,2)
         IT
```

***MONITOR [MO Shift N].** This command is used for entering the C-128's built-in machine language monitor.

```
Syntax: MONITOR
```

***MOVSPR [M Shift O].** A statement used for positioning or moving a sprite on screen.

```
Example: MOVSPR 1,100,100
```

This will position sprite #1 at screen location 100,100.

NEW [none]. This command erases a Basic program from memory and clears all variables.

NEXT (See FOR/TO/STEP/NEXT)

NOT [N shift O]. An operator that calculates the logical NOT of an expression. It results in negative 1 minus the original value.

ON [none]. This conditional statement is used with GOTO and GOSUB to branch to a specified line number when a certain condition is met. ON allows program execution to branch to the line numbers listed, depending on the value of the expression following ON.

If the expression is valued at 1, then the program branches to the first line number; if the expression is 2, then the program branches to the second line number; and so forth. ON...GOTO/GOSUB is actually a method for using several IF conditions in one program line.

```
Example: 10 INPUT K$
         20 ON K$ GOSUB 100,200,300,400
```

OPEN [O Shift P]. This statement is used for opening a disk, tape, printer or screen for file input or output.

```
Example: OPEN 15,8,15
```

The logical file number is 15, the device number is 8 (disk drive), and the secondary address is 15.

OR [none]. A logical operator that calculates conditions as true or false.

***PAINT [P Shift A].** A graphics statement used for filling an area with a specified color.

```
Syntax: PAINT[Color Source],X,Y[,Mode]
```

See RCLR for discussion of Color Source. Modes: 0=defined by color source; 1=defined by non-background source. X,Y is the starting coordinate from 0,0 to 320,200.

```
Example: 70 PAINT 1,149,101,0
```

This will fill in a circular shape built with the BOX, CHAR, CIRCLE, COLOR and DRAW examples in this glossary.

PEEK [64:P Shift E/128:PE Shift E]. This numeric function returns the contents of a specified memory location.

```
Example: PRINT PEEK(53280)
```

***PEN [P Shift E].** This function reveals the coordinates of a light pen.

***PI [pi symbol, π].** This variable returns the value of pi (3.14159265).

***PLAY [P Shift L].** This musical statement lets you select the voice, octave, envelope, volume and notes that you want played within a Basic program.

```
Syntax: PLAY "Voice, Octave, Tune Enve-
  lope, Volume, Filter, Elements"
```

***POINTER.** This function is used for finding the address of a specific variable.

Example: X = POINTER(Y)

POKE [64:P Shift O/128:PO Shift K]. This statement changes the value of any memory location in RAM.

Example: POKE 53280,1

This places 1 in memory location 53280.

POS [none]. This function is used for finding the current cursor column position within a defined window.

Example: PRINT POS(X)

***POT [P Shift O].** This function can tell both the direction of a game paddle and whether the fire-button has been pressed.

Example: PRINT POT(N)

PRINT [?]. A commonly used statement that outputs words and numbers to the screen.

```
Example: PRINT "THIS IS THE SPECIAL
         ISSUE."
```

PRINT# [P Shift R]. This statement outputs information to peripherals such as printers, disk drives and cassette players.

```
Example: OPEN4,4: CMD4
         PRINT#4,"HERE IT IS"
         CLOSE4
```

***PRINT USING [? US Shift I].** This statement defines the format of words and numbers for printing to the screen, printer or other device.

Syntax: PRINT [#Filenumber] USING "format";list to be printed

***PUDEF [P Shift UE].** This statement allows redefinition of any of four symbols used in a Print Using statement: blanks, commas, decimal points and dollar signs.

Example: PUDEF "*"

This places an asterisk where any blank occurs.

***RCLR [R Shift C].** This function gives the specific color of any requested color source.

Syntax: RCLR(X)

X is the color source 0–6.

Example: PRINT RCLR(0)

This would print the color (1–16) of a background in 40-column mode.

The color source numbers are as follows:

0 40-column background
1 bit-mapped foreground
2 multicolor 1
3 multicolor 2
4 40-column border
5 40/80-column characters
6 80-column background

***RDOT [R Shift D].** This function is used to locate a pixel cursor on a high-resolution screen and to tell its color.

Syntax: RDOT(X)

0 = X coordinate, 1 = Y coordinate, 2 = color source

Example: PRINT RDOT (0)

READ [64:R Shift E/128: RE Shift A]. This statement reads the numbers and text held within a Basic program's Data statements.

```
Example:  5 READ X
         10 PRINT X
         15 IF X = 5 THEN END
         20 GOTO 5
         30 DATA 1,2,3,4,5
         40 END
```

***RECORD [R Shift E].** This is used with relative files. For reading or writing data, it positions a relative file pointer at any specified byte of data within a record.

Syntax: RECORD#Logical file number,Record number [,Byte number]
Example: RECORD#2,22,4

REM [none]. This statement is used with a Basic program for personal commentary about it. All the REM statements are ignored by the computer and are never executed.

```
Example: 10 REM PROGRAM WRITTEN
            BY MARY DOE
```

***RENAME [RE Shift N].** This command is used for changing the name of a file on disk.

Syntax: RENAME [,Ddrive number] "Old name" To "New name"[,Udevice number]

***RENUMBER [REN Shift U].** This command renumbers the lines of a Basic program.

Syntax: RENUMBER [New start][,Increment] [,Old line]

RESTORE [RE Shift S]. This statement resets the Read pointer so that previously read data can be read again.

Syntax: RESTORE [line number]

Example: RESTORE 100

This resets the pointer to line 100, where old Data statements will be reread.

***RESUME [RES Shift U].** This is an aid to programmers when an error has been encountered within a Basic program. This statement tells the computer where to continue program execution after an error has been trapped.

Syntax: RESUME [Line number/NEXT]

Example: RESUME 10

RETURN [RE Shift T]. This is used with a Gosub statement and returns program execution to the next statement after the occurrence of the Gosub.

```
Example: 10 GOSUB 500: PRINT"BACK
            AGAIN?"
         20 END
         500 INPUT"PRESS ANY KEY TO
            CONTINUE";X$:RETURN
```

***RGR [R Shift G].** This function tells which graphics mode the computer is in.

Example: PRINT RGR(0)

RIGHT$ [R Shift I]. This string function elects the rightmost set of characters within a predefined string variable.

```
Example: X$ = "SPECIAL ISSUE"
         PRINT RIGHT$(X$,3)
         SUE
```

RND [R Shift N]. This function is used to generate a random number between 0 and 1.

Example: X = INT (RND(1)*5) + 1

X will be a whole number between 1 and 5.

***RSPCOLOR [RSP Shift C].** This function identifies the color values of a multicolored sprite.

Syntax: RSPCOLOR (Register 1 or 2)

***RSPPOS [R Shift S].** This function identifies the speed and position of a sprite.

Syntax: RSPPOS Sprite#,Position/Speed

***RSPRITE [RSP Shift R].** This function identifies the six characteristics of a sprite. These characteristics will have been previously specified in the Sprite command.

```
Example:  5 FOR X = 0 TO 5
         10 PRINT RSPRITE (1,X)
         20 NEXT X
```

RUN [R Shift U]. This command executes a Basic program in memory. It can be used with a line number to begin execution at that line. It can also be used to load and execute a Basic program from disk.

Syntax: RUN [Line number]
RUN "Filename"[,Ddrive number] [,Udevice number]

Example: RUN "MY PROGRAM"

***RWINDOW [R Shift W].** This function identifies the size of a screen window. The number of lines (0), rows (1) and whether the display is 40 or 80 columns (2) are returned.

Syntax: RWINDOW (X).

where X is 0, 1, or 2.

SAVE [S Shift A]. This command is

used for storing programs on disk or tape. Without a specified filename, SAVE automatically tries to store the program to tape.

Syntax: SAVE ["Filename"][,device number] [,EOT flag]

A device number of 1 is tape; 8 is a disk drive. If EOT is 1, then the end of tape flag is set.

```
Example: SAVE "MY PROGRAM",8
         SAVE "MY PROGRAM"
```

***SCALE [SC Shift A].** This statement changes the scaling of bit-mapped images in Multicolor and High Resolution modes.

Syntax: SCALE N[,X max,Y max]

```
Example: SCALE 1 Turns on scaling.
         SCALE 0 Turns off scaling.
```

***SCNCLR [S Shift C].** This statement clears the screen in the graphics mode specified.

Syntax: SCNCLR Mode # (0–5)

***SCRATCH [SC Shift R].** This disk command erases a file from disk and deletes its reference from the disk directory.

Syntax: SCRATCH "Filename"[,Ddrive number][,Udevice number]

Example: SCRATCH "RUNFILE",D1

In a dual disk drive system, this deletes the file "Runfile" from the disk in drive #1.

SGN [S Shift G]. This function identifies the sign (positive, negative or zero) of a number.

Example: PRINT SGN(X)

SIN [S Shift I]. This function identifies the sine of a number measured in radians.

Example: PRINT SIN(X)

***SLEEP [S Shift L].** This statement delays program execution for a specified number of seconds (0 to 65535).

Syntax: SLEEP N

***SLOW [none].** This statement returns the computer to 1 MHz speed of operation after the Fast command.

***SOUND [S Shift O].** This statement is used for creating sounds and music on the C-128. Seven parameters can be defined with this statement.

Syntax: SOUND V,F,D[,DIR][,M][,S][,W][,P]

V = voice; F = frequency; D = duration; DIR = stop direction; M = minimum frequency; S = step value; W = waveform; P = pulse width:

SPC [64:S Shift P/128:none]. This function is used for the spacing of characters within Print and Print# statements.

Example: PRINT "HI";SPC(10);"THERE"

***SPRCOLOR [SPR Shift C].** This statement is used for setting multicolor 1 and/or 2 for sprites.

Example: SPRCOLOR 5,6

sets multicolor 1 to purple and multicolor 2 to green for all sprites within a Basic program.

***SPRDEF [SPR Shift D].** This command is used to enter the C-128's built-in sprite editor.

***SPRITE [S Shift P].** This statement activates and deactivates sprites' colors, expands sprites and sets the screen priorities for any of eight sprites.

Syntax: SPRITEF <#>[, On(1)/Off(0)] [, Foreground color (1–16)][,Priority (0—in front of screen objects/1—in back of)][,Horizontal expansion (1—on/0—off)] [, Vertical expansion (1—on/0—off)] [, Mode (0—standard/1—multicolor)]

Example: SPRITE 2,1,8,0,0,1,0

***SPRSAV [SPR Shift S].** This statement transfers 63 bytes of sprite data from a text string variable into a storage area in memory. A sprite image can be stored as a string variable; the data within a string variable can be transferred into a sprite; and one sprite's data can be duplicated in a second sprite.

Syntax: SPRSAV<Origin>,<Destination>

SQR [S Shift Q]. This function identifies the square root of a number.

```
Example: X = 81
         PRINT SQR (X)
         9
```

***SSHAPE/GSHAPE [S Shift S/G Shift S].** These two statements are used for saving and loading rectangular areas of high-resolution/multicolor screens to and from Basic string variables. After you've drawn a figure on the screen, you use SSHAPE to save its bit-mapped image and location.

Syntax: SSHAPE Variable, X,Y corner coordinates[,X2,Y2 opposite corner coordinates]

Syntax: GSHAPE Variable[X,Y corner coordinates][,Replacement mode (0—place as was saved; 1—invert shape; 2—OR shape with the area; 3—AND shape with the area; 4—XOR shape]

ST [none]. This system variable defines the status of the system after an input/output operation has occurred.

***STASH [S Shift T].** This statement is used with the RAM memory expander. It moves the contents of memory into the expansion RAM.

***STEP (See FOR/TO/NEXT/STEP)**

STOP [64:S Shift T/128:ST Shift O]. This statement stops execution of a Basic program and displays on screen a Break message, identifying the line number where the stop occurred.

```
Example: 10 X = X + 1
         20 PRINT X
         30 IF X = 25 THEN STOP
         40 GOTO 10
```

STR$ [ST Shift R]. This string function converts a number into a string so that the number could be edited for output.

```
Example: 5 X = 255.1
         10 PRINT "$";STR$(X) + "0"
```

This will display the number X as $225.10 rather than as $225.1

***SWAP [S Shift W].** This statement is used with the RAM memory expander. It swaps the contents of internal RAM with the contents of the external RAM expander.

Syntax: SWAP #Bytes, Starting address of host RAM (0–65535), 64K RAM expansion bank # (0–3), Starting address of RAM expansion (0–65535).

SYS [S Shift Y]. This statement calls and executes a machine language subroutine from within a Basic program or from Immediate mode.

Syntax: SYS Address
or SYS Address [,A][,X][,Y][,S]

A is accumulator; X, Y and Status are registers.

TAB [T Shift A]. A statement used in Print and Print# statements for placing an expression at a specific horizontal position on screen.

```
Example: PRINT TAB(5);"THESE WORDS
         ARE INDENTED FIVE SPACES"
```

TAN [none]. This numeric function identifies the tangent of an angle in radians.

Example: PRINT TAN(X)

***TEMPO [T Shift E].** A musical statement that defines the speed of a song to be played.

Syntax: TEMPO X

where X is 0–255.

TI and TI$ [none/none]. These are system variables used for reading the 24-hour real-time clock built into the computer. TI is the current numeric value of the clock in 1/60 seconds. TI$ is the string that reads TI as a 24-hour clock.

Example: TI$ = "121005"

This is 12:10 PM and 5 seconds.

TO (See FOR/TO/STEP/NEXT)

***TRAP [T Shift R].** This statement is an error detector within a running Basic program. When a bug is discovered, program execution is transferred to a pre-specified line number. The EL variable will identify the line in which the error occurred; ER will specify the error condition; and ERR$ will actually display the error message.

***TROFF [TRO Shift F].** This statement turns off Tracing mode.

***TRON [TR Shift O].** This statement turns on Tracing mode for use when debugging Basic programs. When activated and a program is running, the line numbers of the program are displayed before each line is executed, so that the programmer can easily see where an error occurs.

UNTIL (See DO/LOOP/WHILE/UNTIL/EXIT)

USR [U Shift S]. This function transfers program execution from Basic to a machine language program. Variables can be passed between Basic and machine language using this function.

VAL [none]. This function translates into a number a string that's holding numbers. It specifies the numeric value of the string by searching for numbers from left to right. Upon encountering an invalid character, it halts.

```
Example: X$ = "15 MILES"
         PRINT VAL(X$)
         15
```

VERIFY [V Shift E]. This command verifies that a program in memory is the same program as the one on disk or tape. This is a safety feature that lets you ensure that the program you saved has really been saved in its entirety. For tape users, the Verify command is used for determining the free space on tape for the next program to be saved.

Syntax: VERIFY "Program name" [,Device number][,Relocate flag (0 loads to the start of Basic; 1 loads to where the program was originally saved from)]

***VOL [V Shift O].** A musical statement that defines the volume of sounds produced with the Sound and Play statements. Volume can be set from 0 to 15.

WAIT [W Shift A]. This statement pauses program execution while the computer monitors the status of the Input/Output registers searching for a particular value. The Wait command is used when performing certain I/O operations.

Syntax: WAIT<Location>,<Mask 1> [,<Mask 2>]

WHILE (See DO/LOOP/WHILE/UNTIL/EXIT)

***WIDTH [WI Shift D].** This statement determines the width of the pixel cursor used for drawing lines with the graphics commands.

Syntax: WIDTH 1 sets a single width.
WIDTH 2 sets a double width.

***WINDOW [W Shift I].** This statement is used for identifying a screen window in 40- or 80-column Text mode. Coordinates range from 0–39/0–79 horizontally, and from 0–24 vertically.

Syntax: WINDOW top-left column, top-left row, bottom-right column, bottom-right row[,Clear (1 to clear the window)]

Example: WINDOW 50,10,70,20,1

Defines and clears a window whose top-left point is 50,10 and whose bottom-right point is 70,20 (in 80-column mode).

***XOR [X Shift O].** A function that provides the exclusive OR of two specified argument values.

Syntax: XOR (X1,X2)

X1 and X2 range from 0–65535. R

Circle 424 on Reader Service card.

New From Votrax

- Easy to Use — Plug In and Speak
- Clear, Unlimited Speech
- Screen Echo Speaks Words and Symbols
- Character Mode Spells Each Word
- Rate, Pitch and Volume Controls
- Completely ROM Based, No Software to Load
- Self-Contained Speaker

The ultimate speech synthesizer for the Commodore 64.

Also Introducing Trivia Talker II*

- Votalker C-64 Version of Votrax's Popular Talking Trivia Game
- Five Game Categories for Up to Four Players
- Create Your Own Questions and Answers
- Multiple Choice Questions With Timed Responses
- Questions and Answers Displayed and Announced

Special Offer

- Buy Votalker C-64 for **$99.95**
- Get Trivia Talker II ~~$39.95~~ **FREE**

Other Votrax Products:

- PSS, T-N-T, Stand-Alone Devices
- IBM, Apple II Plug In Board Synthesizers
- Votrax Speech Chips

votrax®

VOTRAX, INC.
1394 Rankin Troy, Michigan 48083-4074
(313) 588-2050 TWX-8102324140 Votrax-TRMI

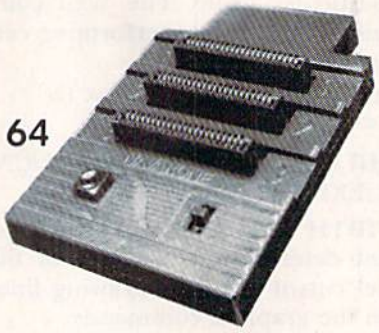
Call Votrax at (800) 521-1350

*Trivia Talker I operates only through the Commodore 64 on board SID chip. Price: $39.95

Circle 11 on Reader Service card.

SUGGESTED RETAIL PRICE $29.95 (includes shipping)

EXPAND YOUR COMMODORE 64 WITH A 3-SLOT CARTRIDGE EXPANDER



— Eliminates wear on connectors
— Saves time when changing cartridges
— Built in Reset button
— Holds up to 3 cartridges
— Convenient access to cartridges

Are you tired of turning your Commodore 64 computer upside down just to insert or change a cartridge? Then you need the new Cartridge Expander from Navarone. We have been making these units for the TI-99/4A home computer for over three years, and now have the same high quality product available for your Commodore 64.

Take advantage of our introductory offer **NOW**

NAVARONE

TO ORDER: Send Cashier's Check or M.O. or personal check (allow 10 days to clear), to Navarone Industries, Inc., 11836 Judd Court St., 304B Dallas TX 75243 or call 214-437-1118. For MASTER/VISA CARDS and C.O.D.'s add 3%. CA Residents please add 6.5% Sales tax. Outside US add $2.00 for Shipping.

Circle 425 on Reader Service card.

COMMODORE ACCESSORIES

VOICE SYNTHESIZER FOR COMMODORE VIC-20 & C-64

NEW Demonstration Software Available!

• Over 250 word vocabulary-affixes allow the formation of more than 500 words • Built-in amplifier, speaker, volume control, and audio jack • Recreates a clear, natural male voice • Plug-in user ready with documentation and sample software • Case size: 7¼"L x 3¼"W x 1⅜"H

Applications: • Security Warning • Telecommunication • Teaching • Handicap Aid • Instrumentation • Games

Part No.	Description	Price
JE520CM	For VIC-20 and C-64	$99.95
JE521TS	Text-to-Speech Program. For C-64 or VIC-20 (5¼" Disk)	$ 9.95
JE521	Commodore Interface Module.	$19.95

RS232 ADAPTER FOR VIC-20 AND COMMODORE 64

RS232 Interface

The JE232CM allows connection of standard serial RS232 printers, modems, etc. to your VIC-20 and C-64. A 4-pole switch allows the inversion of the 4 control lines. Complete installation and operation instructions included.
• Plugs into User Port • Provides Standard RS232 signal levels • Uses 6 signals (Transmit, Receive, Clear to Send, Request to Send, Data Terminal Ready, Data Set Ready).

JE232CM. $39.95

300 BAUD AUTO MODEM FOR COMMODORE 64

• 3 year warranty
• Includes Smart 64+4 Terminal Software

Mitey-Mo $74.95

GENERAL PURPOSE INPUT/OUTPUT CARD

MW611 (For C-64). $199.95

PARALLEL PRINTER INTERFACE

FREE 2K BUFFER INCLUDED!

MW350 (For VIC-20 & C-64). . . $69.95

MICRO WORLD ELECTRONIX, INC.

$20.00 Minimum Order — U.S. Funds Only
California Residents Add 6% or 6½% Sales Tax
Shipping — Add 5% plus $1.50 Insurance
Send S.A.S.E. for Quarterly Sales Flyer!

Spec Sheets — 30¢ each
Send $1.00 Postage for your *FREE 1986 JAMECO CATALOG*
Prices Subject to Change

MasterCard VISA

Mail Order Electronics Worldwide
Jameco ELECTRONICS

1355 SHOREWAY ROAD, BELMONT, CA 94002
Phone Orders Welcome (415) 592-8097 Telex: 176043

1/86

This Publication is available in Microform.

University Microfilms International

Please send additional information for _____

Name _____

Institution _____

Street _____

City _____

State _____ Zip _____

300 North Zeeb Road
Dept. P.R.
Ann Arbor, Mi. 48106

The Second Annual RUN

Special Issue

The Second Annual* RUN *Special Issue

This is simply the most incredible all-in-one Commodore reference library you can buy. It's the ideal gift for every C-64/C-128* enthusiast, and the perfect complement to last year's hot-selling special edition. In fact, last year's *Special Issue* was so popular, all 200,000 copies were sold within a matter of days.

And this year, there are even more reasons to order early. In this exciting *Special Issue*, you'll get:

- An in-depth look at the new C-128... step-by-step information that leads you through every extraordinary C-128 feature: graphics, music, telecommunications, and programming. Plus, an introduction to CP/M, and a C-128 programmer's aid.

- 500 "Magic" hints and tricks for the C-64 from Louis Sander... every entry published in *RUN* in 1985, plus more than 100 *never-before-published tricks* for the C-64 and C-128.
- A *free* pull-out wall chart—even bigger than last year's—containing vital reference material for C-64 and C-128 users... keywords, commands, programming codes.
- Learn-as-you-go tutorials for new C-64/C-128 users... everything from graphics to maintenance.
- Commodore Primer... a glossary of nearly 125 commands and terms.
- A complete, up-to-date list of Commodore clubs and user groups.

Remember, this *limited edition* of *RUN* will be in big demand. Hurry and order your copy... and order one for a friend. Simply return the coupon, or call ☎ **1-800-258-5473.** (In NH, dial 1-924-9471.)

FREE Pull-Out Wall Chart Included

"I happened upon your first Special Issue in a bookstore... never before have I seen a publication more packed with all the 'right stuff'?!"

Gregory Stubblefield
San Diego, CA

* Commodore 64 and Commodore 128 are registered trademarks of Commodore Business Machines, Inc.

YES. *Please send me* _____ *copies of the* ***Second Annual RUN SPECIAL ISSUE.*** *I am enclosing $3.95 for each copy that I order.*

☐ Check Enclosed ☐ MC ☐ VISA ☐ AE

Card # _____ Exp. Date ____/____

Name _____ Signature _____

Address _____

City _____ State _____ Zip _____

Canada & Mexico $4.50, Foreign Surface $7.15, US funds drawn on US bank. Foreign Airmail, please inquire. Orders will be shipped December, 1985.

CW Communications/Peterborough, 80 Pine Street, Peterborough, NH 03458 **RNSP**

Please Send Me The Following Back Issues of ReRUN:

☐ **Buy Both Vol. I and Vol. II*—SAVE $5**
☐ Cassettes $17.94 ☐ 2 Disks $37.94

☐ **Spring Edition*** —Includes: + Tax Records 64, + CalcAid, °Quatro, and + Fly The Grand Canyon. (Runs on C-64, VIC-20, and/or C-128. Separate media for C-64 and VIC-20. Please specify.)

☐ **GAMEPAK**—Features never-before-published games: Ski, + Hassle-Castle, and + Lava Pit, Plus, **RUN** favorites like Find The Word, and Tag. (Runs on C-64/C-128.)

☐ **Summer Edition**—Includes: Sound Effects, + Joystick Artist, + Play Ball, and Money Manager. (Runs on C-64, C-128.)

☐ **Fall Edition**—Includes: Home Run Derby, Turtle Graphics, Big Letters, Function Keys, Test Maker, Flynn's Gold, + Disk Doctor, and more! (Runs on C-64, C-128.)

☐ **Productivity Pak Disk** + —Includes: Home Finance Aid, Basic 4.5, Datafile, DF Mail, DF Report, DF Print, DF Calc, Run Term, Run It Write, Disk Master, Graphmaker, Memo, Screen Print (programs run on C-64/C-128 in 64 Mode only)

☐ **Winter Edition**—Includes: Perfect Typist, Pay the Bills, UltraQuiz, Perfect Pitch, Make Music, Source Reader, Source Print, Brainstorming, + Songfest, + Joy to the World, + Adeste Fideles, + Spirited Sprites, and more! (programs run on C-64/C-128 in 64 Mode only)

+ Available on disk only.
° Available on C-64 version only.
Disks contain more programs than cassettes.
* Separate version available for VIC-20

☐ C-64 ☐ VIC-20

☐ Cassette $11.47 each

☐ Disk $21.47 each

☐ Payment enclosed ☐ AE ☐ Visa ☐ MC

Card # _____

Exp. Date _____

Signature _____

Name _____

Address _____

City _____ State _____ Zip _____

Prices include postage and handling.
Please allow 4-6 weeks for delivery.
US funds on US banks only.

SP-86-BI

80 Pine St. • Peterborough, NH 03458

If Your ReRUN Library Is Incomplete,

Fill In The Blanks!

Missing any of these hot selling back issues of ReRUN?

- **Volume I**
- **Volume II**
- **Spring Edition**
- **Gamepak**
- **Summer Edition**
- **Fall Edition**
- **Productivity Pak**
- **Winter Edition**

It's not too late to catch up! While quantities last, you can get every **ReRUN** published. Enjoy the most popular RUN programs on cassette or disk! It's as easy as filling out the coupon, or calling **1-800-258-5473**. In NH, dial 1-924-9471.

Circle 445 on Reader Service card.

THE SMART WAY TO SAVE YOUR *RUN*

You'll find all your favorite issues of **RUN** in minutes—and in great condition—with smart-looking binders or file cases from Jesse Jones.

Sturdy, protective file cases make for easy access to each issue, while rugged binders allow magazines to lay flat for easy reference. Both hold 12 issues, are custom-designed in brown with gold spine lettering, and are **unconditionally guaranteed.**

Order today!
File Cases: $6.95 ea.; 3/$20; 6/$36.
Binders: $8.50 ea.; 3/$24.75; 6/$48.

YES! Please send me protection for my **RUN**:

_____ File Cases _____ Binders

I enclose my check or money order for $ _____.

Name _____

Address _____

City _____ State _____ Zip _____

US currency only. Outside US, add $2.50 per item for postage and handling. Please allow 4-6 weeks for delivery.

MAIL TO: Jesse Jones Box Corp., PO Box 5120, Dept. RUN, Philadelphia, PA 19141

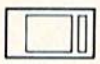
You Have a Choice.

Numeric Keypads

CP Numeric Keypad, Deluxe Model.

- Top quality, low profile key switches for smooth, reliable data entry.
- Easily connected with computer keyboard.
- No software is required. 100% Compatible with all programs.
- Available for Commodore 64, SX-64*, VIC-20 and Apple IIe Computers.
- One year warranty and available in three models:

Regular $49.95

 Plus $59.95

Deluxe $69.95

Power Supply

- Has better features than the original one at $39.95.
- Is serviceable, NOT disposable.
- Works dependably with one year warranty.
- For Commodore and Atari* Computers.

Computer Place (213) 325-4754
23914 Crenshaw Blvd. Torrance, CA 90505

* Requires adaptor at additional cost. VISA, MC & AE accepted. No C.O.D. Add $3.00 shipping. CA residents add 6.5% sales tax. Dealer inquiries welcome.
Commodore 64, SX-64 and VIC-20 are trademarks of Commodore Business Machines, Inc. Atari is the trademark of Atari Corp., Apple IIe is the trademark of Apple Computer, Inc.

Circle 416 on Reader Service card.

TYPING TUTOR + WORD INVADERS

Learn to use your keyboard quickly and properly. TYPING TUTOR starts with the 'home keys' and automatically evaluates your typing performance, introducing you to new keys in many gradual steps as your skills develop. WORD INVADERS puts real excitement into your touch typing practice while reinforcing proper typing techniques.

"This is the best typing tutor we have seen yet; ★★★★+"
INFO-64

"Best typing tutor I've seen — Better than Mastertype"
Microcomputer Courseware Evaluation

"WORD INVADERS is fantastic"
Editors of Consumer Guide

NEW! Commodore Plus/4 or 16..... Tape $21.95 Disk $24.95
Commodore 64..... Tape $21.95 Disk $24.95
VIC 20 (unexpanded)..... Tape $21.95

IFR (FLIGHT SIMULATOR)

Put yourself in the pilot's seat! This program provides a very challenging, realistic simulation of flying under Instrument Flight Rules (IFR) in a single engine light plane. Realistic instrumentation and aircraft performance. Plenty of thrills for pilots and non-pilots alike.

"It is tremendous fun." **Compute's Gazette**

"It's a great program, and as a pilot I found it to be very realistic. My brother, a current commercial pilot and a former Air Force flight instructor with over 3,500 hours in military and civilian aircraft was also quite impressed."
Private Pilot

NEW! Commodore Plus/4 or 16.....Tape or Disk $29.95
Commodore 64.....Tape or Disk $29.95
VIC 20 (unexpanded).....Cartridge $39.95

ACADEMY SOFTWARE VISA Shipping and handling $1.00 per order. CA residents add 6% tax.

P.O. Box 6277 San Rafael, CA 94903 (415) 499-0850

ATTENTION

Foreign Computer Stores
Magazine Dealers

You have a large technical audience that speaks English and is in need of the kind of microcomputer information that CW/Peterborough provides.

Provide your audience with the magazine they need and make money at the same time.

For details on selling **80 MICRO, inCider, HOT CoCo, RUN and AmigaWorld** contact:

SANDRA JOSEPH
WORLD WIDE MEDIA
386 PARK AVE., SOUTH
NEW YORK, NY 10016
PHONE (212) 686-1520
TELEX—620430

From p. 44.

```
2Ø FORJ=828TO84Ø:READK:POKEJ,K:NEXT
3Ø PRINT"COLOR POKES FOR COL COMMAND:{CRSR
   DN}"
4Ø PRINT"(RETURN GIVES GREY/BLU/GRN){CRSR D
   N}"
5Ø B=12:INPUT"BORDER";B:POKE49174,B
6Ø S= 6:INPUT"SCREEN";S:POKE49179,S
7Ø C=13:INPUT"CURSOR";C:POKE49184,C
8Ø SYS828:PRINT"NOW TYPE COL <RETURN>"
81 DATA 173,ØØØ,ØØ2,2Ø1,Ø67,2Ø8,Ø3Ø,173
82 DATA ØØ1,ØØ2,2Ø1,Ø79,2Ø8,Ø23,173,ØØ2
83 DATA ØØ2,2Ø1,Ø76,2Ø8,Ø16,169,Ø12,141
84 DATA Ø32,2Ø8,169,ØØ6,141,Ø33,2Ø8,169
85 DATA Ø13,Ø76,Ø48,192,234,23Ø,122,2Ø8
86 DATA ØØ3,Ø76,119,ØØØ,Ø76,121,ØØØ,Ø96
87 DATA 141,134,ØØ2,169,ØØØ,162,ØØ7,157
88 DATA 255,ØØ1,2Ø2,24Ø,ØØ4,Ø76,Ø55,192
89 DATA 234,Ø96,234,234,Ø96,ØØØ,251,ØØØ
9Ø DATA 251,ØØØ,251,ØØØ,251,ØØØ,251,169
91 DATA Ø76,133,115,169,ØØØ,133,116,169
92 DATA 192,133,117,Ø96
```

Eric Breault
Pawtucket, RI

Screen reverser—The accompanying C-64 program lets you reverse the entire screen by executing a simple SYS command. Characters in normal video are changed to reverse video, and those in reverse are changed to normal. Because of the speed of machine language, the change is instantaneous.

To use the feature in a program, just execute lines 30–34 one time, then execute SYS 52992 whenever you want to reverse the screen. Some uses might be a flashing screen as a reward in an educational program, a flashing arcade game screen or even a flashing sign. Use your imagination and have fun!

```
1 FORY=1TO27:READZ:CS=CS+Z:NEXT
2 IFCS<>4345THENPRINT"DATA ERROR":STOP
3 PRINT"CHECKSUM OK. DELETE LINES 1-4,"
4 PRINT"THEN SAVE THE PROGRAM.":END
1Ø REM SCREEN REVERSER - RICHARD MIU
2Ø REM SYS52992 REVERSES THE SCREEN
3Ø FORJ=52992TO53Ø18:READK:POKEJ,K:NEXT
31 DATA 169,ØØØ,133,251,169,ØØ4,133,252
32 DATA 162,ØØ4,16Ø,ØØØ,177,251,Ø73,128
33 DATA 145,251,2ØØ,2Ø8,247,23Ø,252,2Ø2
34 DATA 2Ø8,24Ø,Ø96
```

Richard Miu
Mansfield, OH

Supersound—This is a continuous sound effect that goes on in the background while you program or do anything else with your computer. You can shut it off by pressing the run/stop and restore keys or by Poking off voices 1 and 3. You can change the sound dramatically by using different values for the variables in lines 110–140. Use the values indicated in the REM statements.

```
1Ø FORJ=1TO9:READK:CS=CS+K:NEXT
2Ø IFCS=1125THENPRINT"{CRSR DN}DATA OK. ERA
   SE LINES 1Ø-4Ø, THEN SAVE.":END
3Ø PRINT"{CRSR DN}DATA STATEMENT ERROR!":ST
   OP
4Ø :
1ØØ REM SUPERSOUND - MILIND S. PANDIT
11Ø SF=15 :REM FINE SPEED
12Ø SC= Ø :REM COARSE SPEED. Ø BEST.
13Ø V1=17 :REM VOICE 1: 17,33,OR 129
14Ø V3=33 :REM VOICE 3: 17,33,OR 129
15Ø FORJ=1TO24:POKE54272+J,Ø:NEXT
16Ø POKE54296,15:POKE54286,SF:POKE54287,SC:
   POKE54277,Ø:POKE54278,255
17Ø POKE5429Ø,V3:POKE54276,V1
18Ø FORJ=1TO9:READK:POKE49151+J,K:NEXT
19Ø POKE56333,127:POKE788,Ø:POKE789,192:POK
   E56333,129
2ØØ DATA173,Ø27,212,141,ØØ1,212,Ø76,Ø49
21Ø DATA234
```

Milind S. Pandit
Houghton, MI

Beeper—Here's a clean, non-clicky beep routine that can be used in Basic, compiled Basic and machine language programs. Include this loader subroutine in your program, and call the beep with a simple SYS 50000. The resulting sound is a cross between a beep and a bell, and it's really pleasing to the ear.

```
1Ø FORJ=1TO82:READK:CS=CS+K:NEXT
2Ø IFCS=1Ø822THENPRINT"{CRSR DN}DATA OK. ER
   ASE LINES 1Ø-4Ø, THEN SAVE.":END
3Ø PRINT"{CRSR DN}DATA STATEMENT ERROR!":ST
   OP
4Ø :
1ØØ REM BEEPER - BRUCE JAEGER
11Ø FORJ=5ØØØØTOJ+81:READA:POKEJ,A:NEXT
12Ø DATAØ32,133,195,169,ØØ9,141,ØØ5,212
13Ø DATA169,Ø3Ø,141,Ø15,212,169,13Ø,141
14Ø DATAØØ1,212,169,Ø15,141,Ø24,212,169
15Ø DATAØ4Ø,141,ØØ4,212,169,ØØ7,141,163
16Ø DATA195,Ø32,145,195,169,Ø31,141,ØØ4
17Ø DATA212,169,Ø2Ø,141,163,195,Ø32,145
18Ø DATA195,Ø32,133,195,Ø96,162,ØØØ,138
19Ø DATA157,ØØØ,212,232,224,Ø24,2Ø8,248
2ØØ DATAØ96,165,162,Ø24,1Ø9,163,195,141
21Ø DATA162,195,165,162,2Ø5,162,195,2Ø8
22Ø DATA249,Ø96
```

Bruce Jaeger
St. Paul, MN

Line bell—Here's a typing aid for you. It produces a typewriter-like bell sound when your cursor reaches the 75th column. It can warn you when you're ready to fall out of a line while programming.

```
1Ø FORJ=1TO54:READK:CS=CS+K:NEXT
2Ø IFCS=59Ø8THENPRINT"{CRSR DN}DATA OK. ERA
   SE LINES 1Ø-4Ø, THEN SAVE.":END
3Ø PRINT"{CRSR DN}DATA STATEMENT ERROR!":ST
   OP
4Ø :
1ØØ REM LINE BELL - J. VAN DE PEPPEL
11Ø FORJ=ØTO53:READK:POKE49152+J,K:NEXT
12Ø SYS49193
13Ø DATA169,ØØ9,141,ØØ5,212,141,ØØ6,212
14Ø DATA169,11Ø,141,ØØ1,212,169,Ø15,141
15Ø DATAØ24,212,169,Ø17,141,Ø04,212,169
16Ø DATAØ16,141,Ø04,212,Ø96,165,211,2Ø1
17Ø DATAØ75,2Ø8,ØØ3,Ø32,ØØØ,192,Ø76,Ø49
18Ø DATA234,12Ø,169,Ø29,141,Ø2Ø,ØØ3,169
19Ø DATA192,141,Ø21,ØØ3,Ø88,Ø96
```

Jurgen van de Peppel
Ede, Holland

Basic UNNEW for the C-64—This program creates a single Basic line with an Unnew program embedded in a REM statement. Add the line to any other program, and you can resurrect a mistakenly erased program by entering SYS 2065.

Circle 430 on Reader Service card

BUSINESS • SCIENCE • EDUCATION

The complete statistical package for only: **$99**

COMM-STAT

A Powerful Tool for Data Analysis and Forecasting

- Easy to use, no commands to memorize (menu-driven)
- Can handle very large data files
- Descriptive Statistics, t-tests (independent and dependent samples) General ANOVA/ANCOVA (up to five factors, Repeated Measures, unbalanced designs, contrasts adjusted means, and more), Correlations, Multiple Regression, (up to 25 predictors), Cross-Tabulation, Significance Tests, 10 Nonparametric Statistics, and more
- User defined (multiple) conditional selection of subsets of cases, various ways of treating missing data
- Flexible Data Editor, easy entering/editing of data, complex (conditional) transformations of variables, and more
- Can also access files created by spreadsheets and data bases
- Barcharts, Scatterplots, clear comprehensive output
- Will run on COMMODORE-64 with 1 disk drive

To order send check or money order for $99 (plus $5.00 shipping and handling) to:

MasterCard VISA

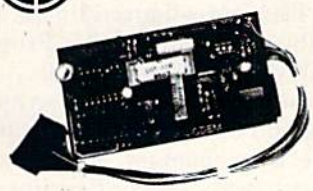
STATSOFT

2831 East 10th Street, Suite 3, Tulsa, OK 74104. (918) 583-4149

ASK ABOUT VERSIONS FOR OTHER COMPUTERS!

Circle 427 on Reader Service card

trans com



TCM-1 MODEM

for the Commodore 64®

TURN YOUR COMPUTER INTO A TELECOMMUNICATIONS SYSTEM!

$79.95

suggested retail price

MasterCard VISA

Dealer inquiries invited

- Installs INSIDE the computer
- User Port access allowed with modem installed
- Auto Answer/Auto Dial
- Direct connect to phone line
- Software included for uploading and downloading
- Compatible with new C-128 computer

COMING SOON
NEW TCM-1200
300/1200 Baud Modem

trans com, inc.

703-13 ANNORENO DRIVE
(312) 543-9055 ADDISON, IL 60101

Circle 428 on Reader Service card

PIANO ROLLS PLAYED BY COMPUTER

ARE YOU KIDDING?!!!

NOW YOU CAN TURN YOUR HOME COMPUTER INTO AN ENTERTAINMENT CENTER AND MUSIC EDUCATION MACHINE. JUST ADD OUR MIDI CABLE AND ANY MIDI INSTRUMENT.*

The appearance of the MIDI on home organs and synthesizers opens up a whole new future for music. QRS player piano rolls from 1900 to present day were performed by great artists from Scott Joplin, Fats Waller, and George Gershwin to Liberace, Peter Nero, and other contemporary artists. Most of this library of over 10,000 songs has been converted to digital signals and placed on floppy disks that are available for popular microcomputers.

THE COMMODORE 64/128 AND APPLE IIc PACKAGES ARE NOW AVAILABLE FOR ONLY $49.95. IT INCLUDES A MIDI INTERFACE AND A SIX SONG SAMPLE DISK WITH CLASSICAL, CONTEMPORARY, SHOW MUSIC, and even **RHAPSODY IN BLUE** played by the composer **GEORGE GERSHWIN** that you can enjoy with your MIDI equipped instrument.* For information about other supported computers, MIDI cables, and Casio MIDI instruments, call or write:

Micro-W. DISTRIBUTING INC.

1342B Route 23
Butler, New Jersey 07405

(201) 838-9027

VISA MasterCard

Dealer & Distributor Inquiries Invited

*For Best performance an eight voice polyphonic instrument is required.

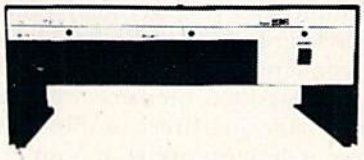
Commodore is a registered trademark of Commodore Business Machines Inc.

Circle 439 on Reader Service card

The Clone

DUAL DISC DRIVE FOR COMMODORE

- Commodore 64 Compatible
- 6 Kb Buffer Memory
- 2 Connector Serial Buss
- Daisy Chain Up To 4 Drives
- No Overheat Time
- Formats, Copies and Verifies in Less Than 2 Minutes
- 1 Full Year Warranty



CPS-10

COMMODORE POWER SUPPLY

- Two 100-Watt Outlets
- Surge and Spike Protection
- RFI and EMI Protection
- All Metal, Heavy-Duty Case
- Fully Serviceable
- Perfect Replacement for Commodore Power Supply
- 1 Full Year Warranty

Call TODAY

(618) 344-7912

HBH Sales Company

A DIVISION OF HBH CORPORATION

225 WEST MAIN STREET
COLLINSVILLE, IL 62234

Line 0 must be a REM, one quote, exactly 66 characters of any sort, then a closing quote. It cannot contain extra spaces. If you get an error when running the program, something is wrong with your Data statements. If all is well, the program will list a transfigured line 0, plus the numbers 11–23, with the cursor on the 11. Pressing the return key 13 times will delete all lines but 0.

Save line 0 for future use; you can add it to any program by using a merge or append utility, or by typing the other program after this one is in memory. This line can be renumbered, but it must always be the first line in your program.

```
Ø REM"66 CHARACTERS - SEE TEXT"
1Ø FORJ=1TO66:READK:L=L+K:NEXT:RESTORE
11 IFL<>8939THENPRINT"DATA ERROR":STOP
12 FORJ=1TO66:READK:POKE2Ø54+J,K:NEXT
13 PRINT"{SHFT CLR}{4 CRSR DNs}":FORJ=1ØTO2
   3:PRINTJ:NEXT
14 PRINT"{HOME}";:LIST-1
15 DATA Ø85,Ø78,Ø78,Ø69,Ø87,Ø5Ø,Ø48,Ø54
16 DATA Ø53,Ø58,16Ø,ØØ3,2ØØ,177,Ø43,2Ø8
17 DATA 251,2ØØ,2ØØ,152,172,187,255,145
18 DATA Ø43,165,Ø44,2ØØ,145,Ø43,133,Ø6Ø
19 DATA 172,187,255,132,Ø59,174,187,255
2Ø DATA 2ØØ,2Ø8,ØØ2,23Ø,Ø6Ø,177,Ø59,2Ø8
21 DATA 244,232,224,ØØ3,2Ø8,242,2ØØ,2Ø8
22 DATA ØØ2,23Ø,Ø6Ø,132,Ø45,164,Ø6Ø,132
23 DATA Ø46,Ø96
```

Louis F. Sander
Pittsburgh, PA

Emergency UNNEW—Under most conditions, the following C-64 Direct mode line will recover a Basic program so it can be listed on the screen or printer. This will, I hope, give you enough information to enter it again.

```
POKE 2050,1 : SYS 42291
```

Do not try to edit a program thus resurrected; doing so can result in an unrecoverable crash. You must use the New command with the resurrected program, then reenter it from scratch. If the program is short enough to list on a single screen, you can list it, use New again, then use your cursor and return keys to reenter each line.

Mike Oehrtman
Stillwater, OK

Filename finder—On the C-64, SYS 62913 displays the name of the currently active file. Did you ever load a program or open a disk file, then later forget its name? Or have you saved something, then wondered what you called it? Try this magic SYS call, and the forgotten filename will materialize before your eyes! Usable in Direct or Program mode, it displays the filename at the current cursor position. JSR $F5C1 is the machine language version.

Rick Crone
Jackson, TN

Autostart programs for the C-64—Here's a simple routine that adds the autostart feature to Basic programs on tape or disk. Type it in and run it, and if your Data statements are correct, you'll be asked to delete lines 11–13. Delete them, then save the program.

Now, when you want to save an autostart version of a program, just run Autostart and follow the instructions on the screen. Once it is saved, a Syntax error message will appear on the screen; disregard it. At this point, your computer is in an altered state, so you must reset it or turn it off then back on.

Programs saved in this manner must be loaded using the form:

```
LOAD"filename",8,1
```

They will run as soon as they are loaded, with no further action from you. Because the autostart process puts characters onto the screen, it's helpful if the saved program clears the screen as one of its first operations. (If you're using tape, change the 8 to a 1 in the Load statement and in the screen message in line 80.)

```
1Ø REM AUTOSTART - BILL GIEL
11 FORX=1TO48:READY:CS=CS+Y:NEXT
12 IFCS<>5991THENPRINT"DATA ERROR":STOP
13 PRINT"DELETE LINES 11-13":END
2Ø FORA=679TO726:READB:POKEA,B:NEXT
3Ø Q$=CHR$(34):PRINTCHR$(147)CHR$(18)"TO MA
   KE AN AUTOSTART COPY OF A PROGRAM:"
4Ø PRINT:PRINT"LOAD YOUR PROGRAM, CLEAR THE
    SCREEN,"
5Ø PRINT"AND MOVE THE CURSOR TO THE BOTTOM
   LINE.":PRINT
6Ø PRINT"THEN ENTER THIS AS A SINGLE COMMAN
   D:":PRINT:PRINT"POKE43,166:";
7Ø PRINT"POKE44,2:POKE77Ø,167:POKE771,2:SAV
   E"Q$"FILENAME"Q$",8"
8Ø PRINT:PRINTCHR$(18)"** YOU MUST ALWAYS L
   OAD"Q$"FILENAME"Q$",8,1 **
9Ø DATA 169,147,Ø32,21Ø,255,169,Ø82,Ø32
91 DATA 21Ø,255,169,Ø85,Ø32,21Ø,255,169
92 DATA Ø78,Ø32,21Ø,255,169,Ø19,Ø32,21Ø
93 DATA 255,169,131,141,ØØ2,ØØ3,169,164
94 DATA 141,ØØ3,ØØ3,169,ØØ1,141,198,ØØØ
95 DATA 169,Ø13,141,119,ØØ2,Ø76,131,164
```

Bill Giel
Yonkers, NY

C-64 List freezer—The following lines will Poke a machine language routine into empty memory locations at 679–688, then set the vector IQPLOP at 774–775 to point to the start of the routine. Once that has been done, you can temporarily halt a program listing by pressing the CTRL, Commodore, shift or shift-lock keys. The feature will stay active until you reset your computer.

```
10 FOR J = 679 TO 688 : READ K : POKE J,K : NEXT
20 POKE 774,167 : POKE 775,2 : NEW
30 DATA 072,173,141,002,208,251,104,076,026,167
```

If you wish, you can add these lines to the Basic part of the C-64 wedge program. That way, this useful feature will be enabled along with the wedge.

John P. Valengavich
New Britain, CT

Compatible color RAM—Different versions of the C-64 behave differently when you Poke characters to the screen, and often you must Poke the color as well as the character. Below is a Basic loader for a machine language subroutine. It clears the screen and instantly fills color RAM with the cursor color. It eliminates all those extra Pokes and makes your program usable on all versions of the C-64.

As an added bonus, it can be used to change the color of all characters without clearing the screen. You can make it a part of your main program or run it separately, then have the main program use it. The loader lines will put the machine language into memory, ready to use until the computer is turned off.

After running the loader lines, SYS 828 will clear the screen and set your color memory to the current cursor color. To change the colors of all characters on the screen without clearing the screen, use SYS 828 + 5. The commands work either in Direct mode or in a program.

The machine language can be relocated to any place you have 28 bytes of free memory. You need only change the value of AB in line 10 and replace the 828s, mentioned above, with the new value of AB.

```
10 AB = 828 : FOR J = AB TO AB + 27 : READ K : POKE J,K : NEXT
20 DATA 169,147,032,210,255,173,134,002,041,015,162,000,157,000
30 DATA 216,157,000,217,157,000,218,157,000,219,232,208,241,096
```

C.J. Mohler
Walnut Creek, CA

2. Computers—C-128

C-64 to C-128 conversions—Many Basic programs written for the C-64 will work in C-128 mode as well. When evaluating a program's chances for success, you should pay particular attention to these keywords, which behave differently in the two modes. The 128 mode's special features are mentioned:

FRE—The argument is no longer a dummy. It determines the memory bank to be reported on.

LIST—A program-mode List does not terminate program execution.

RESTORE—This can reposition the Data pointer to the beginning of a specified line.

SYS—Registers can be loaded with values separated from SYS by commas.

PEEK—The Bank statement affects Peek. In addition, most C-128 memory locations have been changed.

POKE—Same considerations as Peek.

Also, since Basic 7.0 has many more keywords than the previous versions, there's a chance that some statements, previously perfectly legal, will now contain embedded keywords.

Louis F. Sander
Pittsburgh, PA

C-128 monochrome monitor—The manual doesn't say so, but it's easy to use a monochrome monitor on the C-128's beautiful, 80-column output. The signal is available on the computer's rear-panel RGBI connector, which mates with any male DB-9 plug, such as the Radio Shack 276-1537. Connect the center wire of your monitor's video cable to pin 7 of the DB-9, and connect the shield to pin 1 or 2.

If you put the appropriate connectors on your monitor cables and cut them to the proper length, you can facilitate switching your monitor between the 80- and 40-column outputs on the 128.

Margaret Ittel
Los Angeles, CA

40/80 display switching—Although it's not mentioned in the manual, the 40/80-display key is read whenever the stop and restore keys are pressed. So, to switch from one mode to the other, just set the display key, then tap the stop and restore keys.

Louis F. Sander
Pittsburgh, PA

C-128 display width Peek—Location 215 decimal ($D7 hex) is a display-width flag. When PEEK(215) = 0, your computer is in 40-column mode. When PEEK(215) = 128, it's in 80-column.

If you use a 1902, or other monitor that must be switched from 40- to 80-column mode, you can use the flag to help you set the switch. For example:

```
100 IF PEEK(215) = 128 THEN PRINT "SWITCH TO 40 COLUMNS"
    : GRAPHIC0
```

If you're in 40-column mode when this line is executed, nothing will happen. If, however, you're in 80-column mode, the message will print to your screen, and your computer will switch to 40-column text mode (Graphic0). Seeing the message, you'll manually switch the monitor.

Kenneth Hottes
Danbury, CT

Easy program load—It's easy to load any program shown on a C-128 directory display. Just move your cursor to the line containing the program, then type DLOAD. Press the tab key three times to put your cursor on the PRG indicator, then hold down your space bar until the PRG is obliterated. When you press the return key, your program will be loaded from disk.

Mary Martinez-Haver
Squirrel Hill, PA

Safe and easy scratches—When making multiple scratches on the C-128, the following technique can save you time and potential anguish. If you think you want to scratch all programs whose filenames start with "ABC," for example, do this:

```
DI {SHFT R} "ABC*" {RETURN}
```

This will give you a directory listing of every file whose name starts with ABC. Check the listing carefully to ensure it doesn't contain something you want to keep.

When you're satisfied, move your cursor up to the line you originally entered and change the DI to SC. Press the return key, and the files you examined will be immediately erased.

Hashafisti Scratchi
Tokyo, Japan

Non-destructive reset—If, while pressing the C-128's reset button, you hold down the run/stop key and keep it depressed until the reset is finished, you'll get a reset that doesn't disrupt Basic's pointers or lose your Basic program. When this type of reset is finished, the computer comes up in its Machine Language Monitor mode. To return to Basic, just type X and press the return key, and your program will be awaiting you.

Mary the Juggler
Pittsburgh, PA

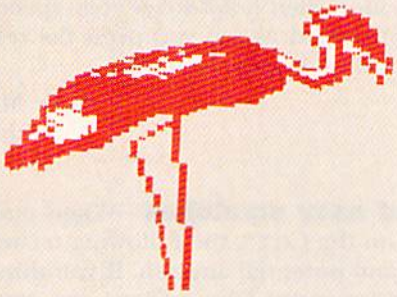
F-keys for data—The accompanying program makes it easy to enter Data statements on the C-128. Run it, then execute the Auto command that appears on the screen. (If you want some other increment between your Data statements, substitute it for the 10 in the Auto command.) Type the line number of your first Data statement, then use the function keys for the following: f1 types the word

ReRUN's WINTER EDITION

Just Imagine It.

Then Watch It Come True!

Turn your great ideas into reality with **ReRUN's Winter Edition***—our most creative software package yet! You'll get more than a dozen programs for the C-64/C-128 (in C-64 mode)** that will help you create everything from an essay or term paper to a novel piece of art!



Programs That Get Results

Does your mind paint a picture faster than you can sketch it? Then try "High-Spirited Sprites", a utility that lets you rapidly draw, animate view, and save sprite graphics!

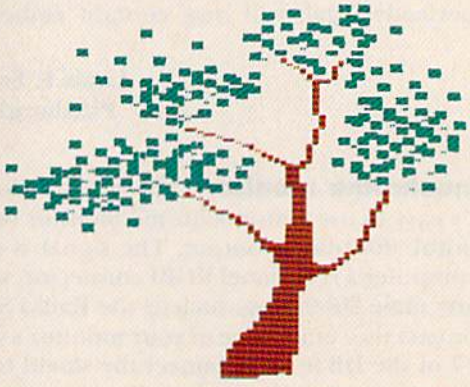
You can even create, save, load, and print colorful screens with three easy-to-use programs: "Screen Maker," "Screen Viewer," and "Screen Booter"!

Have you been dreaming up an interesting approach to a term paper or feature article, but the pieces just won't fall together? Then you'll love "Brainstorming," a thought-processing program that classifies your thoughts into groups and then prints an outline of your idea.

Or, if music is your specialty, you'll enjoy "Make a Little Music," a utility that lets you create, save and load songs into your own programs by using a joystick!

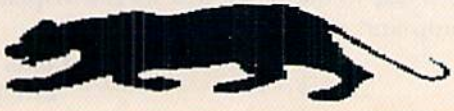
Programs with Variety

And that's just the beginning! **ReRUN's Winter Edition** also has programs to print your checks and teach you the fundamentals of assembly language, as well as **RUN**'s new checksum proofreader, for accuracy in typing in programs.



Of course, every **ReRUN** cassette and disk is in ready-to-run format, which means you can enjoy each top-quality **RUN** program without time-consuming keyboarding or debugging. Your **ReRUN Winter Edition** comes complete with a booklet of easy loading instructions and documentation.

Why not start bringing your great ideas to life today? Get creative! Get the **ReRUN Winter Edition!** Cassettes are $11.47, and disks are just $21.47. Make your choice, and then return the coupon or attached order card with payment. Or, call **1-800-258-5473.** (In NH, please dial 1-924-9471.)



YES! **I WANT TO BE MORE CREATIVE!** Please send me the ReRUN Winter Edition.

☐ Cassette $11.47 ☐ Disk $21.47

☐ Payment Enclosed ☐ AE ☐ VISA ☐ MC

Card # Exp. Date

Signature

Name

Address

City State Zip

SP/86

Please Allow 4–6 Weeks for Delivery

ReRUN

80 Pine Street, Peterborough, NH 03458

Screen Maker, Screen Booter, High-Spirited Sprites, Graphics Display System, Wedgemaker, Commodore Helps Pay the Bills and many more.

* Available December 1985. Note some programs on disk only.

** C-64 and C-128 are registered trademarks of Commodore Business Machines, Inc.

DATA, f3 or f5 types a comma and f7 is equivalent to pressing the return key. The Auto command takes care of the line numbers on subsequent lines.

```
5ØØØ REM F-KEYS FOR DATA - FRED HUNT
5ØØ1Ø FOR L=1 TO 8 : KEYL,"" : NEXT
5ØØ2Ø KEY1,"DATA"
5ØØ3Ø KEY3,","
5ØØ4Ø KEY5,","
5ØØ5Ø KEY7,CHR$(13)
5ØØ6Ø PRINT"{SHFT CLR}{3 CRSR DNs}AUTO1Ø{HO
      ME}"
```

Fred Hunt
Albany, GA

Hexadecimal keypad—Most C-128 owners appreciate the 14-key numeric keypad. Many also enjoy using the built-in machine language monitor. Wouldn't it be nice to be able to enter hexadecimal numbers from the keypad?

Well, it's easy. Just redefine the function keys as the letters A through G. Since you have eight key values and only six letters, you can use the other values for common symbols such as $ and #. The following little program makes everything automatic.

```
10 FOR A = 1 TO 8 : READ A$ : KEY A,A$ : NEXT
20 DATA A,E,B,F,C,$,D,#
```

Tim Shea
Burlington, VT

Sprite shower—This one-liner for the Commodore 128 gives a dazzling and animated depiction of sprites and how they move. Not only is it fun to watch, but it's also a useful tutorial on C-128 sprites and how they are controlled.

```
10 FOR J = 3584 TO 4095 : POKE J,204 : NEXT : FOR K = 1 TO 8 :
   SPRITE K,1,K : MOVSPR K,50*K#K : NEXT
```

Mary Lee McCafferty
Butler, PA

Spritestorm—Here is an upgraded version of the above one-liner. This one features multicolor sprites that change as they move about. Some of the changes are a sight to behold.

```
10 FOR L = 1 TO 255 : FOR J = 3584 TO 4095 : POKE J,L : NEXT :
   FOR K = 1 TO 8 : SPRITE K,1,K,1,1,1,1 : MOVSPR K,50*K#K :
   NEXT : NEXT
```

For another variation, add STEP2 after the 4095.

Mary Lee McCafferty
Butler, PA

Sprites and function keys—Memory location 4096 ($1000 hex) is used by the C-128's function key routines. One common way of loading sprites will inadvertently and unnecessarily overwrite this location, thus clobbering your function keys. Beware.

Although sprite definitions are only 63 bytes long, we're accustomed to saving them in 64-byte chunks. The extra byte is generally unused, but it's convenient to include it when Poking the sprite data. But for sprite #7, that 64th byte is memory location 4096. Be sure you don't Poke it there; you'll have no more function keys.

Bruce Jaeger
St. Paul, MN

Sprite insurance—Sometimes your sprites will fly into never-never land, behaving erratically or refusing to obey your commands. A reliable way to return their feet to the ground is

```
FOR J = 1 TO 8 : MOVSPR J,0#0 : NEXT
```

This immediately brings them to their senses.

P.W. Herman
Hollywood, CA

SPRDEF in Program mode—It's not mentioned in the manual, but you can use the SPRDEF command within a program. When you exit the editor, your program will continue at the statement following the SPRDEF. (SPRDEF transfers control to the 128's built-in sprite editor. You exit the editor by pressing the return key in response to the Sprite Number prompt.)

Douglas Johnson
Seminole, FL

Exiting Quote mode—The C-128's keyboard offers a handy way to escape from Quote mode—press the ESC key, then press C. To make this even easier, just redefine the f1 key:

```
KEY1,CHR$(27) + "C"
```

Bruce Jaeger
St. Paul, MN

More to print—We're all familiar with embedding cursor controls and color changes inside Basic Print statements. As you use the 128, don't forget that now you can also print the bell sound (CTRL G), TAB (the tab key or CTRL I), and, in 80-column mode, Underline (CTRL B) and Flash (CTRL O). CHR$(130) turns off underlining, while CHR$(143) turns off flashing.

Sue Dohnim
Otherna, ME

PRINT@ in disguise—While the main use described for the C-128's CHAR keyword is to print text on the graphics screens, the keyword can also be used to position the cursor in Text mode. Just make its first parameter a 0, and you have a ready-made PRINT@:

```
100 CHAR 0,10,20,"THIS IS AT POSITION 10,20"
```

Loura Grantham
Bluegrass, KY

Doodle and the 128—If you have the popular Doodle program, it is extremely easy to load its pictures into the C-128. Just do this in Direct mode:

```
GRAPHIC 1 : BLOAD "doodlename", P7168
```

Bruce Jaeger
St. Paul, MN

C-128 sound box—Here's an amazingly useful program for exercising the Play statement. After you run it, whatever key you press will be "played." If it's a note, you'll hear it. If it's something else, like the element for a half note or a sharp, you'll hear its effect when the next note is sounded. If you press an illegal key, you'll get an error message.

Since it works so quickly and simply, the program is ideal for exploring the differences between the various notes, lengths, octaves, tone envelopes and filter and volume settings. If you want to become a music expert, run it as you study pp. 276–277 of the *Commodore 128 System Guide.*

```
10 REM 128 SOUND BOX—LOUIS F. SANDER
20 TRAP30:GETKEYA$:PLAY"M" + A$:GOTO20
30 IFER = 30THENEND:ELSEPRINT"??":RESUME20
```

Louis F. Sander
Pittsburgh, PA

Multi-voice bug avoidance—Sometimes the second or third voice on the C-128 gets "lost," especially after other programs have used the voice registers. To ensure that your machine will make music or sound with all three voices, early in your program set each voice's volume and filter individually, like this:

```
10 PLAY "V1 U15 X0"
20 PLAY "V2 U15 X0"
30 PLAY "V3 U15 X0"
```

Jerry Kozak
Kayell, MN

Using C-64 utilities—If you have some C-64 programmer's utility programs, many of their features may be usable on programs written for the C-128. Just save the C-128 program, then go to C-64 mode and activate your utility. Next, load the 128 program and operate on it in the usual way. Be careful, because the two computers handle some keywords differently, and the 64 list and screen editor routines don't know what to do with the new C-128 keywords.

Mary Haver
Wood Islands, PEI
Canada

Renumber bug—The Renumber command accurately handles all Goto statements and other references within program lines, except one. If your program contains a List command with line numbers after it, Renumber will miss it entirely. There's no error message and no renumbering, either.

Lucy S. Terrier
Alton, IL

3. Computers—Plus/4 and C-16

Plus/4 and C-16 organ—Here's a rudimentary organ program for the new Basic 3.5.

```
10 VOL 8 : A = PEEK(198) : IF A = 64 THEN 10 : ELSE A = A*15 :
   SOUND 1,A,20 : SOUND 2,A,20 : GOTO 10
```

Jerry W. Jarvis
Spokane, WA

Plus/4 and C-16 Super Palette—This program elegantly displays all the Basic 3.5 colors, at all luminance levels. Instructions appear in lines 3 and 4. When entering C$ in line 100, hold down the control (CTRL) key, then press each number key from 1–8. Release the control key and hold down the Commodore key, then press 1–8 again. You should end up with 16 reverse-field characters between the quotes.

```
1 REM SUPER PALETTE-LOUIS F. SANDER
2 REM
3 REM COLOR KEYS CHANGE BKGD COLOR
4 REM NUMBERS 0-7 CHANGE BKGD LUM
5 :
100 C$=" - SEE TEXT - ":N$="01234567"
110 C=2:GRAPHIC3,1:TRAP250
120 COLOR0,C:COLOR2,1:COLOR3,C:COLOR4,C
130 BOX3,0,0,10,23,0,1
140 CIRCLE2,4,10,3,8:PAINT2,+0,+1
150 SSHAPEA$,0,0,10,23
160 FORX=0TO15:FORY=0TO7:COLOR2,X+1,7-Y
170 GSHAPEA$,(X*10),(Y*24),0
180 NEXT:NEXT:PAINT3,159,199
190 GETKEYA$
200 FORJ=1TO16
210 IFASC(A$)=ASC(MID$(C$,J))THENC=J
220 NEXT:FORJ=1TO8
230 IFA$=MID$(N$,J,1)THENL=VAL(A$)
240 NEXT:COLOR3,C,L:COLOR4,C,L:GOTO190
250 COLOR0,2:COLOR1,1:GRAPHIC0
```

Louis F. Sander
Pittsburgh, PA

Plus/4 word processor tip—I use a non-Commodore printer with my Plus/4, and I often want to use one of its special typefaces with the Plus/4's built-in word processor. Unfortunately, the word processor has only limited built-in means of accessing printer-special features, and my printer requires a complicated command string.

I solve the problem by executing the following simple program before entering the word processor.

```
10 OPEN 4,4 : CMD4
20 PRINT (Printer's code for accessing special typeface)
30 PRINT#4 : CLOSE4
```

The printer does not reset when the computer enters the word processor, so when I print out my document, it comes out in the typeface I selected above.

Chris Edgeworth
Jasper, TX

Plus/4 tab clear—To clear a single tab in the Plus/4's built-in word processor, you put your cursor at the position in question, then simultaneously press the CTRL and = keys to clear only that tab. Because of an error in the manual, it took me six weeks of struggle to find this little secret.

Judy H. Maxwell
Leawood, KS

Plus/4 and C-16 easy saves—Make your first program line

```
1 REM {SPACE} programname
```

Then you can save it by listing that line, putting the cursor on the 1 and pressing the f5 key. DSAVE" will overwrite the 1 REM {SPACE} and pressing the return key will save the program.

G. Bradford Tiffany
Needham, MA

Circle 479 on Reader Service card

CAD-3D

NEW ADVANCED 3-D GRAPHICS

For C-64 and C-128*

View Designs in Multiple Perspectives

Construction of geometric and structural designs AUTOMATIC ROTATION AND TRANSLATION of figures Maximum of 2000–3000 lines!

Virtual, real, relative and absolute rotations and translations

Disk loading and saving of figures

Load capability to superimpose figures (merging)

Easy to use, joystick controlled printer/plotter capability of designs on Commodore printers; 801, 802, 803 and 1520 plotter!

You can add rotated or translated figures to your own programs

You can make modifications with Doodle Graphic library available

from home to professional applications.

Applications for: architects, designers, engineers, programmers, and more.

At the special introductory price of $39.95 + shipping and handling order line (415) 441-1607

Money orders, CODs and checks accepted. Allow a maximum of 3 to 4 weeks for delivery. Prices do not include applicable taxes, duties or extra money for CODs. In Europe contact: IHT technologies, Via Montenappoleone. 9-Milan Italy-ph 2/701657. C-64, C-128, 801, 802, 803 and 1520 are trademarks of Commodore Business Machines. Doodle is a trademark of City Software.*(1) in 64 mode.

IHT SOFTWARE
Suite 162 - 2269 Chestnut St.
San Francisco, CA 94123

Circle 459 on Reader Service card

FREEDOM ASSEMBLER

SYMBOLIC ASSEMBLER
POWERFUL MONITOR CODE DEBUGGER
3 PROGRAMS IN ONE CARTRIDGE

NOW FOR C-128

$49.95 AN ALL NEW VERSION CARTRIDGE TAKES ADVANTAGE OF THE 128'S POWER

Uses 2 Mhz for lightning FAST Assemblies
write your own machine code for
6502 - 6510 - or 65CO2

written 100% in machine language

C-64 AND VIC-20 VERSIONS STILL $39.95

FREEDOM EDITOR

A Cartridge based EDITOR that aids in creating, debugging, and modifying BASIC programs. Includes:

C=128 IN 128 MODE for C=64
$29.95

VIEW the directory, FIND, MOVE, COPY, DELETE, APPEND plus MANY more

ZIPP~CODE~48 cartridge based for C-64

Write code for smart peripherals or robotics - hobby or industry.

Cross-Assembler for 8Ø48/49 8748 etc.

Full Simulator! $49.95

Specify product and machine

free shipping

Check or money order U.S. funds

Hughes Associates

45341 Harmony Lane
Belleville, Mi 48111

phone orders
(313) 699-1931

Circle 455 on Reader Service card

NOW GET TRUE DESCENDERS FOR 801, 1525, 803, GP-100, HUSH 80 & SIMILAR PRINTERS

From the Descender ROM People

WILANTA ARTS

SAMPLE ACTUAL SIZE
gypsy
pager
peopl

FEATURING:

- True descenders
- A pleasing alternative
- Uniform character formation
- No change in graphic capability
- No change in software compatibility
- No change in printer operation
- North American standard font
- Complete instructions
- Easy installation
- No soldering

$39.95 Cdn $29.95 U.S.

Ont. Residents add 7% Prov. Sales Tax
Cheque, Money Order, Visa or MasterCard

VISA MasterCard

WILANTA ARTS
6943 Barrisdale Dr.
Mississauga Ont.
L5N 2H5

1-416-858-9298

Get a Wilanta Descender ROM Today and make your old nightmare Just a font memory of yesterday!

MOVING?

SUBSCRIPTION PROBLEM?

Get help with your subscription by calling our new toll free number:

1-800-645-9559*

between 9 a.m. and 5 p.m. EST, Monday–Friday.

If possible, please have your mailing label in front of you as well as your cancelled check or credit card statement if you are having problems with payment.

If moving, please give both your old address and new address.

* New York State residents call 1-800-732-9119.

Circle 442 on Reader Service card

Print Shop is a trademark of Broderbund Software™

GRAPHICS DISK $14.95 AND MORE!

FOR USE WITH PRINT SHOP™ PROG.
HERE'S WHAT YOU GET:

- 120 NEW GRAPHICS ON DISK
- 60 SAMPLE GREETING CARD VERSES (CHOOSE & USE)
- GRAPHIC MAKING HINTS/EXAMPLES
- GRAPHIC MAKING OVERLAY TOOL
- GREETING CARD LAYOUT FACT CHART

$14.95

Add $2.00 for postage & handling. Calif. residents add 90¢ sales tax.

Send check or M.O. To:

RJ Softshop

4102 E. 7th Street, STE #207A
Long Beach, CA 90804
213-434-1580

Circle 478 on Reader Service card.

NEW

St. Mars Systems Inc.

FOR THE COMMODORE 64

WINDOWS

Screen Processor Utility

A complete windows support package designed to give you windowing capabilities in your BASIC or Assembly Language programs.

- Window color control
- Window size control
- Window move control
- AND MORE....
- Independent window scrolling
- No limit on number of windows
- Position placement control

$24.95 FL Res. Add 5% Sales Tax

DISK

Add $2.00 shipping and handling • Orders shipped within 48 hours

MasterCard **CALL NOW** VISA

305-657-2018

Or send Check or Money Order to:
ST. MARS SYSTEMS, INC.
1400 Clay St., Winter Park, FL 32789

Plus/4 slow lister—You can slow down all listing and printing on this machine by pressing ESC A before listing your program. This automatically puts the machine into Insert mode, which causes it to execute the Insert routine before it prints a line to the screen. Remember that ESC does *not* work like shift and CTRL—you press and release the escape key, then press A or whatever character follows it.

Randy Thompson
Eugene, OR

Plus/4 and C-16 tips—To disable the stop key, enter POKE 806,103. Return to normal by entering POKE 806,101. Unlike the 64, all keys repeat on the new machines. To emulate the 64, with only cursor keys, insert/delete and space repeating, enter POKE 1344,0. Return to flying text by entering POKE 1344,128.

Empty the keyboard buffer with POKE 239,0. (The keyboard buffer is from 1319 to 1328.) Keypresses are detected at memory location 2038, much as they are in the C-64 and VIC in location 197. The values returned are generally the same as those for the 64. Run the following program and press some keys.

```
10 GETKEY A$ : PRINT A$
20 PRINT PEEK(2038) : GOTO 10
```

Wayne Arnett
Chandler, AZ

C-16 tips—The Warm Start command is SYS 32768. This is similar to SYS 64738 on the C-64 and SYS 64802 on the VIC. When using the Else command, you must precede it with a colon. All in all, the Commodore 16 is a very nice little machine.

Bob Underdown
Fayetteville, AR

Plus/4 and C-16 graphics—These machines have some wonderful graphics modes that have to be used to be believed. A minor inconvenience is that sometimes you get hung up in a non-text mode, with no obvious way out. I avoid the problem by using another wonderful Basic 3.5 feature—the easily programmable function keys. When I start to program with graphics, I just type KEY1,"GRAPHIC 0" + CHR$(13) {return}. From then on, pressing the f1 key returns me to full Text mode.

Scott Burg
Phoenix, AZ

Plus/4 and C-16 screen titles—With this trick, you can print your program title at the top of the screen and forget about it. It will stay there until you remove it with a SYS 55432 or by pressing the ESC key followed by the N key.

```
10 SYS 55432 : REM CLEAR SCREEN & SET NORMAL WINDOW
20 PRINT "Your title goes here"
30 SYS 56926 : REM SET SCREEN WINDOW BELOW TITLE
```

Jerry W. Jarvis
Spokane, WA

Plus/4 screen Pokes—On the C-64, screen memory starts at 1024, and color memory starts at 55296. On the new Plus/4, screen memory starts at 3072, and color memory starts at 2048. When converting C-64 programs to work on the Plus/4, just add 2048 to C-64 screen Poke locations and subtract 53248 from the C-64 color Poke locations. For example, on the C-64,

```
POKE 1524,1 (letter 'A' in center screen)
POKE 55796,2 (makes it red)
```

would convert to this on the Plus/4:

```
POKE 3572,1 (3572 = 1524 + 2048)
POKE 2548,2 (2548 = 55796 – 53248)
```

The screen map for the C-64 is on page 382 of the *Commodore 64 Programmer's Reference Guide*. The map for the Plus/4 is on page 199 of the user's manual that comes with the computer. [The Plus/4's luminance feature may make it necessary also to change the value Poked to color memory. Ed.]

Kenneth H. Hottes
Danbury, CT

Plus/4 calculated Goto—Jump to any calculated line using this one-liner. To use it, set variable GL to the desired line number, then execute the following line. Please note that the routine changes the Data pointer.

```
1000 POKE 1281,105 : POKE 1282,141 : RESTORE GL :
     GL = USR(GL)
```

Randy Thompson
Eugene, OR

4. Computers—SX-64

SX-64 screen magnifier—Stationery stores carry an 8- × 10-inch Fresnel magnifying lens that is a wonderful magnifier for the SX-64's tiny screen. I mount mine on the clips of a Radio Shack #64-2093 Helping Hands device, using a cardboard strip to protect the plastic. By adjusting the stand and clips, I obtain an enlarged screen to make computing with the SX-64 easier.

Edward S. Wozniak
Oceanside, CA

SX-64 video modulator—You can modify a Texas Instruments modulator, available at many Radio Shack stores, to work with the SX-64 and your television set. Just open it up and replace R6 with a jumper. You may have to fine-tune it a little by adjusting the tuning capacitor. A little goes a long way when tuning it. To operate, the TI modulator requires +5 volts, which is available from several ports on the SX-64. See the printer-interface tricks for some suggestions.

Normand Daoust
Address unknown

SX-64 TV display—The SX-64 lacks a built-in RF modulator. To display its video signal on a TV, you can avoid an external modulator if you have a video cassette recorder. Just plug the video output of the SX into the

Circle 475 on Reader Service card.

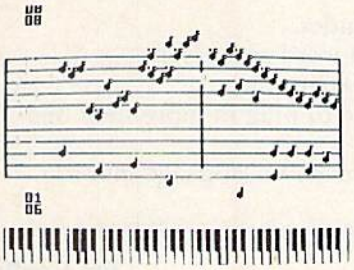
MUSIC POWER!

PLAY AN ENTIRE SONATA!

EUPHONY only $20.00

A 100% machine-language music program for the Commodore 64 and Commodore 128.

"Professional . . . awesome"
-- Stan Jones, Fairbanks News-Miner



Create, edit and play music in 3 voices. Plays long pieces, up to 40 minutes or 40 pages of sheet music! Music comes alive as notes and keys change color as they are played. Music may be accompanied with words. 5-1/2 octaves on screen, 8 octave audio range. Choose any of five instruments for each voice, or create your own instrument with built-in synthesizer. Play any portion at any speed. Use 32nd-notes, 16th-note triplets, ties, legato/staccato, repeats, etc. Continuously change dynamics (loudness) and tempo. Several pieces of classical and popular music included. Full-screen editing of music code, and more!

EUPHONY comes on disk with a 40-page manual. Color monitor recommended. EUPHONY: $20.00 + $2.00 shipping.
EUPHONY+: $25.00 + $2.00 shipping, same features plus prints music scores on Epson and Star Micronics printers having dual density graphics. Music Disk II contains over 80 minutes of additional classical and popular music: $7.50 + $1.00 shipping. C.O.D.s accepted.

10-DAY MONEYBACK GUARANTEE

TCO SOFTWARE

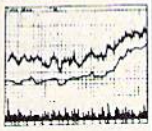
P.O. Box 81504, Fairbanks, AK 99708, 907-479-4898

Circle 474 on Reader Service card

ACORN OF INDIANA™

STOCK BROKER

BEAT THE PANTS OFF MUTUAL FUNDS



BUYING GOOD QUALITY, VOLATILE ISSUES AND USING THE TRADING SYSTEM WILL HAVE YOU FULLY INVESTED AT THE LOWEST PRICES AND CONVERTING TO CASH AS THE STOCK NEARS ITS PEAK.

- BAR GRAPH PRINT-OUTS.
- RECORD UP TO 144 STOCKS ON A DISK.

$39.95 C-64 DISK

LOTTO CIPHER™

GET THE BEST ODDS ON ANY LOTTERY

SIX NUMBER - PICK FOUR - DAILY GAME

- PRODUCES FOUR COMBINATIONS OF NUMBERS TO CHOOSE FROM.
- ANY AMOUNT OF BALLS AND NUMBERS CAN BE PROGRAMMED.
- PRINTS OUT PAST LOTTO NUMBERS DRAWN, PAST COMPUTER PICKS, AND NUMBER DRAW FREQUENCY LIST.
- COMPLETE NUMBER DATA BASE.

$29.95 C-64 DISK

ABANDON SHIP™

S.O.S.

SAILOR JOE HAS VOLUNTEERED TO STAY BEHIND AND KEEP THE SHIP AFLOAT UNTIL HIS CREW MEMBERS ARE RESCUED. CAN HE MAKE IT OR WILL HE HAVE TO ABANDON SHIP? PATCH THE HOLES AND SEAL OFF HOPELESS ROOMS WHILE FIGHTING INVADING SEA CREATURES.

$21.50 C-64 DISK

ACORN OF INDIANA, INC.
2721 OHIO STREET
MICHIGAN CITY, IN 46360

219-879-2284

SHIPPING AND HANDLING, ADD $1.50 - C.O.D.'S ACCEPTED
VISA AND MASTER CARD ORDERS ADD 4%
INDIANA RESIDENTS ADD 5% SALES TAX
DEALER INQUIRIES WELCOME

Circle 438 on Reader Service card

WHO USES ??? THE BANNER MACHINE

FRIENDS
TEACHERS
CLUBS
BUSINESSES
PARENTS

Make professional signs up to 14" tall by any length. Includes 8 letters sizes, 4 fonts (letter styles),15 graphic symbols 20 textured backgrounds, + borders. The Banner Machine $49.95 (each + ship)

1541 PHYSICAL EXAM

NEW 1571 PHYSICAL EXAM
4040 PHYSICAL EXAM
8050 PHYSICAL EXAM
8250 PHYSICAL EXAM

Package includes:
True digital alignment disk with offset tracks. Quiet drive stops to reduce the need for cont. realignment on alps and neutronics drives.
PHYSICAL EXAM $39.95 (each) + ship.
Extra STOPS $ 4.95 (each) + ship.
PLEASE SPECIFY WHICH DRIVE!

CARDINAL SOFTWARE **800-762-5645**

13646 Jeff Davis Hwy. Woodbridge, VA 22191

Circle 477 on Reader Service card

ATTENTION

C-128 USERS

WOULD YOU LIKE TO KNOW HOW CP/M WORKS ON YOUR C-128?

COMPUTERANSWERS has the answer to this question — a CP/M tutorial disk. This CP/M tutorial will help you better understand the CP/M operating system. With this understanding, you will feel at ease in using CP/M.

COMPUTERANSWERS CP/M TUTORIAL will teach you about CP/M, its functions and how it will help you. **COMPUTERANSWERS CP/M TUTORIAL** will give you pre-programed tests to evaluate your progress on such subjects as resident commands, CP/M program operation, do's and don'ts in CP/M, identify errors and how to handle them, and much more.

Also with **COMPUTERANSWERS CP/M TUTORIAL** you will receive **FREE** a CP/M reference card that will aid you looking for commands, when searching through a manual is time consuming.

The **COMPUTERANSWERS CP/M TUTORIAL** is **$22.95** with a money back guarantee. And you'll also receive **FREE** a CP/M reference card. Please add $3.00 shipping and handling charges. Please send check or money order to:

ComputerAnswers
26 Rock Point Road
Wheeling, WV 26003
Phone (304) 232-6700

CP/M is a registered trademark of Digital Research
C-128 is a trademark of Commodore Business Machines

DEALER, DISTRIBUTOR, USER GROUP, AND SCHOOL INQUIRIES WELCOME

C-128 Fever Catch It!!

Circle 476 on Reader Service card

WE WON'T PAY YOUR TAXES!

But **TAX MASTER** will help you compute them more QUICKLY and EASILY. Be the Master of your Income Taxes with **TAX MASTER**, now available for your 1985 Federal Income Taxes for the C64/C128 with single, twin, or dual disk drive and optional printer.

- **FORMS** 1040, 4562, & Schedules A,B,C,D,E, and F.
- **PERFORMS** all arithmetic **CORRECTLY**.
- **EASY CHANGE** of any entry, with easy **RECALCULATION** of the entire form.
- **TRANSFERS** numbers between forms.
- **CALCULATES** your taxes and **REFUND**. Tax tables are included.
- **SAVES** all your data to disk for future changes.
- **PRINTS** the data from each form.
- **DISCOUNT** coupon toward the purchase of next year's updated program.

TAX MASTER ..... (DISK ONLY) .... ONLY $28.00

TIRED OF COMPUTER LOCKUP?

RESET MASTER resets computer even when keyboard locks up. Plugs into serial port. No soldering. Provides 2 serial ports. Includes **RENEW** programs to restore your BASIC program.

RESET MASTER for C64 or VIC 20 ..... **$24.95**

FED UP WITH SYNTAX ERRORS?

HELP MASTER 64 provides Instant On-Line Help screens for all 69 BASIC commands when you need them. Takes no BASIC RAM. No interference with loading, saving, editing, or running BASIC programs. Includes 368 page reference manual, more. For C64.

Specify disk or tape **$24.95**

OTHER MASTER SOFTWARE ITEMS

MODEM MASTER user port extender **$24.95**; w/reset	**$29.95**
Y-NOT? 6-foot serial Y cable, 1 male, 2 female	**$10.00**
C128 80 col monochrome cable for non-RGB monitor	**$ 9.00**
Surge Protector 6 outlet power strip 6-foot cord	**$21.00**
Disk Notcher — lets you use both sides of disk	**$ 8.00**

Send check or money order to:

MASTER SOFTWARE

6 Hillery Ct. Randallstown, MD 21133 (301) 922-2962

All prices in US Dollars. Surface shipping in US & Canada is included. Foreign orders add $5. Canadian orders use Canadian POSTAL money order. Maryland residents add 5% tax.

Circle 429 on Reader Service card

DELUXE RS232 INTERFACE

Whether you want to communicate with a modem, serial printer, another computer, or any other RS232 device, the Deluxe RS232 Interface is the correct choice. Any comparison will show that it is best Commodore compatible RS232 interface available for any price! The Deluxe RS232 Interface is the culmination of 3 years of working with Commodore users who need an RS232 Interface. It supports all standard RS232 connections (2-8, 12, 20, 22) including Ring Detect and Hi Speed Indicator. Four switches in the RS232 cover allow you to set the unit for virtually any standard RS232 configuration. The unit includes a 3 foot cable with either a male or female DB25 connector (specify which). RS232 plus and minus voltages. Users Manual includes a type-in Basic terminal program, basic program transfer routine, and other examples. Add $2.00 for shipping. Suggested retail **$49.95**

PRINTMASTER/S (RS232)

This is an RS232 version of our famous Printmaster/+G. It is a serial bus printer interface providing full RS232 signals for an RS232 printer. Supports pins 2-8, 20. Select 300, 600, 1200, 2400, word, and parity. Supports dot graphics and characters on RS232 versions of Epson, Oki, Gorilla, NEC, and more. Includes 3 ft cable with a male or female connector (specify which). Cassette or external power. Add $2.50 for shipping. Suggested retail **$119.95**

100% 128 COMPATIBLE
See your local dealer or
CALL (206) 236-2983

30 day money back guarantee on all products. Visa and MC welcome. Write to us if you wish to be on a special marketing survey mailing list.

DEALERS CALL US!

Omnitronix

P.O. BOX 43-DEPT.' 9-MERCER IS., WA 98040

input of the VCR, and look at the output of the VCR on your TV.

D.L. Jassby
Princeton, NJ

SX-64 printer interface—As most owners know, the SX-64 has no cassette port from which to pick up +5 volts for the popular Cardco +G printer interface. Not so many people know that on most printers with a Centronics interface, pin 18 of the printer connector is a source of +5 volts. That is the case on my Panasonic KX-P1091 printer, and I took advantage of it by making an easy modification to my Cardco.

I opened up the Cardco +G, cut the 5-volt power wire that went to the cassette connector and resoldered it to pin 18 of the printer connector. If you make this change, be careful. The power wire is white between the computer and the disk drive, but there it is often connected with a different colored wire to the interface. When you open the Cardco, the wire you want is connected to the + terminal of the capacitor. Mine was blue.

Also, be careful in locating pin 18. When you are facing the underside of the board, with the ribbon cable facing downward, pin 18 is the second one up on the second row from the left.

This arrangement has worked for over six months without any sort of problem. My Cardco warranty is probably void, but at least I'm able to use my printer.

T.V. Dinsmore
Knoxville, TN

SX-64 printer interface #2—You can also pick up +5 volts from pin 7 of the joystick port, but that precludes using a dongle or joystick with your program. My ideal solution is to strip an old cartridge by cutting out everything except the connections to pins 2 and 3. Both these pins are connected to +5 volts inside the computer, and they make an ideal source of power for my interface.

Edward J. Pearce
Peru, NY

SX-64 disk tip—Since a shifted run/stop on the SX-64 loads the first program on disk, I start each disk with the Menu program from Commodore's Disk Bonus Pack. That way, a single keypress gives me a complete list of programs on the disk.

Tony Grice
Queensland, Australia

SX-64 dual drives—You can use an external 1541 or similar drive with your SX-64. The external drive must be configured as device #9, which can be done by making a simple internal hardware change. You can also change the device number through software, as described in the 1541 manual, but you must use a slightly magic technique.

First, connect the external drive and change the device numbers on both drives to 9. Then, without powering it down, disconnect the external drive from the serial bus and change the internal drive back to device 8. Reconnect the external drive, and you're all set for dual-drive operation.

David L. Hanna
Winchester, KY

5. Computers—VIC-20

VIC survival kit—When Commodore discontinued the VIC-20, I stocked up on merchandise offered at low prices and ended up with a very useful, fully equipped system. Most of these items are still available new or used, and I'd encourage you to get them:

- A disk drive or a cassette deck with VIC Rabbit from Eastern House.
- The VIC Super Expander.
- A printer and a good word processor.
- 8K or 16K memory expansion.
- An expansion module to plug in more than one cartridge.
- An assembler and a machine language monitor.
- A joystick.
- A large selection of inexpensive cartridges.

Jim Goldfarb
Poughkeepsie, NY

New life for the VIC—Here's a good way to use some of your VIC cartridges on your C-64, in a manner of speaking. The VIC-20 Programmer's Aid cartridge has some excellent utilities on it, the Renumber utility being one of the most useful. After writing a Basic program on the C-64, save it to disk or tape as you usually do. Now load the program into the VIC. (You may need extra memory if the program is a long one.) Next, activate the Programmer's Aid cartridge. You can use all its features, as long as you don't run the C-64 program on the VIC. When your editing is finished, resave the program and move it back to your C-64.

Try this trick with VICMON, too.

Murray Stockill
Seattle, WA

VIC extra memory—The VIC has 512 extra nybbles of memory that you may not have noticed, and that may come in handy from time to time. There are enough color RAM locations (1024) for two text screens, even though few programs use more than one. There are 512 locations, from 37888 to 38399, that a program can use for storing information with Peeks and Pokes. But watch out, for they are only nybbles, not full bytes, and the four high-order bits contain ever-changing garbage.

You can only Poke numbers from 0–15, and, when you Peek them, you must add AND 15 to remove the garbage. You should also know that if you move the screen to a different place in memory or plug in an expansion cartridge, the computer may use these nybbles for character colors. In that case, the nybbles normally used for character colors will be free for you to use.

Brent Dubach
Green Mountain Falls, CO

VIC Super Expander disable—Due to its many added commands, this popular plug-in restricts the variable names you can use in your programs. Moreover, programs that use the function keys will not run properly, if at all. You can deactivate the Super Expander's extra features, leaving its 3K of RAM expansion intact, by

Subscription Problem?

RUN does not keep subscription records on the premises, therefore calling us only adds time and doesn't solve the problem.

Please send a description of the problem and your most recent address label to:

RUN
Subscription Dept.
PO Box 954
Farmingdale, NY 11737

Thank you and enjoy your subscription.

Circle 463 on Reader Service card

NOW USE BOTH SIDES OF YOUR DISKETTE!

5¼" DISKETTE HOLE PUNCH

WITH HOLE GUIDE and EDGE GUIDE

PUNCH OUT IS ALWAYS IN THE RIGHT POSITION
Available for IMMEDIATE Shipment
only $10.00 add $2.00 shipping
CHECK OR MONEY ORDER

DEALER INQUIRIES INVITED

FOR OTHER THAN APPLE AND APPLE LOOK-A-LIKES- WE HAVE A TEMPLATE TO POSITION A REGULAR ROUND HOLE PUNCH FOR THE READ ENABLE HOLE NEAR THE CENTER

COST— 4 for $2.00

N.P.S. Inc.
Dept. (R.S.)
1138 BOXWOOD RD JENKINTOWN PA 19046
(215) 884-6010

Circle 488 on Reader Service card

3 GREAT NEW C64/C128 PROGRAMS!

DESK-PAD! • $17.95
Perfect for your home or office, call up an appointment calendar, a calculator with memory and scientific notation, and 2 handy notepads, all with just ONE keystroke. Plus color-icon display, disk filing, mini-databases, and more!

CRYPTO MASTER • $24.95
Very fast and powerful, this 32-digit key secret cipher allows complete privacy of your word processing or disk data files.

ADVISOR EXPERT SYSTEM DESIGNER
The one you've been reading about...! Create "Expert" systems using the friendly THINK! language. Great for serious engineering as well as education. Includes backward and forward chaining, 4-window color inference display PLUS room for 255 rules and 127 logic variables. Why pay thousands more? **$99.50**

PAYMENT: CHECK OR MONEY ORDER
ADD $2.00 SHIPPING & HANDLING
CALIF. RES. ADD 6% SALES TAX
PLEASE ALLOW 6-8 WEEKS DELIVERY

MEGAGEM
313 E. Surfside, Port Hueneme, CA 93041
Dealer Inquiries Invited!

Circle 462 on Reader Service card

COMMODORE 64 SUPERCADE(R) DISK SOFTWARE

STRIP POKER II: An erotic and sensuous game overtones in video fantsy and computer psychometry. 100% machine language, high quality music, intelligent and fast and fantastic! $49.95

DATA-BLITZ: Backup disk copies super fast with a single drive. Read and write disk errors so you can copy protected disks. $19.95

JOYPEN: A high resolution drawing system that is one of the most powerful available. $29.95
Note: Joypen requires the simon's basic cartridge which is not inlcuded

ASTEROID ATTACK: Laser cannons are your best defence in this fast space game. $19.95

Send your order to:
DATA STREAM (R)
P.O. BOX 87
NAPIER. NEW ZEALAND

Please include $6.00 for airmail. Sorry no C.O.Ds US/Canadian currency, checks, or money orders. Australian residents add 20% to software. Airmail is $5.00 NZ residents please write or phone.

90 day guarantee on all products enquires: phone 57766 Napier. NZ

Circle 484 on Reader Service card

CREATE GRAPHICS! ANIMATION! SOUND! MUSIC!

TECHNIQUE! Easy, direct guide to programming C-64 graphics, animation, sound and music. Use Hi-Res and sprites in your programs. Machine language music program, 12 songs and arcade game included on this $29.95 disk.

BECOME AN EXPERT PROGRAMMER!

BASICally SIMPLE. Quick, easy way to master Basic programming. Use all C-64 commands and operators. Disk is also handy reference guide. Only $20

SPECIAL OFFER! Order **BASICally SIMPLE** and **TECHNIQUE!** together for only $39.95. Send check or money order to:

Free Spirit Software, Inc.
5836 So. Mozart
Chicago, Illinois 60629

DUST COVERS! High quality slate-gray vinyl dust covers for C-64, C-128, 1541 and 1571. Only $6.50 each.

ALL PRICES INCLUDE SHIPPING AND HANDLING. Send for free information on other Free Spirit software and accessories.

Circle 485 on Reader Service card

MEMDISK — 64/128

A *fast, transparent, versatile, reliable* RAM-disk for the C-64 and C-128. Transfer up to 60,000 bytes a second. Use as 1541/1571 disks or as C-128 expansion RAM. Separate power supply and battery back-up.
512K — $394.50* **1M — $474.50***

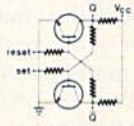
DIAGNOSE — 64

Locate bad RAMs, ROMs, and I/O ports without desoldering and without a video monitor. This diagnostic cartridge is **THE TOOL** for the C-64 technician.
$172.50*

DIAGNOSE — 128

Same as Diagnose-64 only for the C-128 and CP/M modes of the C-128.
$192.50*

* Postage & handling included



MicroDoctor
1655 Central Street
Denver, CO 80211
(303) 458-6713
A Commodore Authorized Quality Service Center

Circle 489 on Reader Service card

This Publication is available in Microform.

University Microfilms International

Please send additional information
for _____
Name _____
Institution _____
Street _____
City _____
State _____ Zip _____

300 North Zeeb Road, Dept. P.R., Ann Arbor, Mi. 48106

Circle 486 on Reader Service card

KEYBOARD CHORD/SCALE MASTER

BEGINNERS OR ADVANCED: LEARN TO PLAY CHORDS AND SCALES ON THE PIANO, ORGAN, OR LATEST ELECTRONIC SYNTHESIZER.

- **CHORD AND SCALE DISPLAYS...** Enhance your skills by sight and sound reinforcement through the reference library.
- **DRILL...**Chord and scales in all common key signatures, randomly selected by the computer.
- **QUIZ...**A continuous percentile determined by correct answers.
- **COMPETE...**A competitive game for the classroom or at home displaying cumulative scores.
- **Written in Machine Language.**

For Commodore 64, diskette only.
Send $39.95 + $1.50 postage/handling.
Michigan residents add 4% sales tax.
Check or money order.
Dealer/Distributor inquiries welcomed

VALHALA SOFTWARE
205 E. Hazelhurst
Ferndale, Michigan 48220
(313) 548-6754

For the C-64 or compatible system:

PRINTSHOP™ GRAPHICS PACKAGE

- 80 Unique and new graphics for your signs, banners, cards, and letterhead.
- 12 exciting high-resolution screens. Use in place of kaleidoscopes. View and print with Screen Magic™
- Make your own graphics! Graphics aids, examples, spacing and layout charts included with this package.

THE PINBALL MACHINE DISK

4 original electronic pinball games. Complete with wiring & bonus diagrams. Hours of challenging fun!

$14.95 PER DISK

(Calif. residents add 97¢ sales tax) All orders add $2.50 postage & handling Send check or money order to:

ON-THE-SPOT Graphics Co., Box 4802, Dept RS, Los Angeles, CA 90051. SASE for info only

C-64 is a trademark of Commodore Business Machines, PRINTSHOP(TM) and SCREEN MAGIC (TM) are trademarks of Broderbund Software, INC.

entering SYS64818 after a reset or after turning on the computer. The technique also works if additional RAM expansion has been installed, but, of course, the 3K is not then available to Basic.

Daniel L. Scheftner
Iwakuni, Japan

VIC Super Expander disable #2—A semi-permanent way to turn a Super Expander cartridge into a normal 3K memory cartridge is to use a piece of thin tape to insulate one of the connector pins. Hold the cartridge with the connector facing you, top side up, and tape over the 13th pin from the right. This disables block-five signals, which contain the Super Expander ROM.

Tim Shea
Burlington, VT

6. Connectors and Cabling

Connector overview—When connecting external devices to your computer, you need special cables, which you can often make yourself if you have the right connectors. This trick describes the connectors used on Commodore machines and gives specific information on finding them in stores.

The round connectors used for power, video and disk/printer hookups are often called DIN connectors, after the German standards organization responsible for their design. Radio Shack carries most of the DIN connectors you will need for your Commodore. Other possible sources are audio stores and distributors of electronic parts.

Your control ports, used for joysticks and similar devices, and the C-128 RGBI video port require a standard connector known as the DB-9, made by many manufacturers. Radio Shack stocks the male and female versions of this connector, plus many associated accessories.

The television connector requires a very common plug known as a phono, or RCA plug, which is available in many variations at Radio Shack.

Your cassette and user ports require printed circuit-board edge connectors. Edge connectors are made in a huge variety of sizes and grades, so finding the right one is like looking for a needle in a haystack. The ones for your Commodore are for 1/16-inch-thick PC boards, with contacts on .156-inch centers. The user port takes a 12-position dual-sided connector, while the cassette port takes a 6-position single- or dual-sided one.

Neither of these are particularly common configurations, so they may be difficult to find. Any good parts house will be able to get them for you, however. They come in a variety of types, costing anywhere from $2 to over $10 (the cheaper ones are fine for your purposes). You'll probably want the kind with solder lugs rather than wire-wrap pins or other special terminals.

If possible, get polarizing keys for each connector to keep each one from being inserted upside down. The key fits into the slots cut between certain fingers on the PC board. If you can't find the exact connectors you need, you can often buy larger ones and cut them down with a hacksaw—messy, but it works!

Connectors for the expansion port are not readily available in stores, and usually must be custom-made from PC-board stock. Many people get expansion port connectors by cannibalizing defunct cartridges.

Victor H. Pitre
Pittsburgh, PA

DIN defined—Commodore's audio/video and serial ports use the well-known DIN connectors, but do you know what DIN stands for? Deutsches Institut für Normung is the German Institute for Standards, which sets industrial equipment specifications, some of which have been adopted by consumer electronics manufacturers.

Frank Biondi
Mount Lebanon, PA

DIN connectors—There are two points of caution when making up cables with DIN connectors.

First, the standard DIN pin numbers are not what you might imagine. For example, depending on the number of pins in the connector, pin 1 may or may not be next to pin 2. The situation is so confusing that published diagrams are sometimes incorrect. (The ones in Commodore publications are all right. Look closely at them to see what we're talking about.)

The second confusing point is that published pinouts often don't say which end of which sex connector they are illustrating, so it's again unclear which pin is which. The Commodore manuals illustrate the solder terminal end of the male connector.

Tiny pin numbers are always molded into the insulator on the connector, so if your eyes are good and you're careful, you shouldn't have any trouble.

Louis F. Sander
Pittsburgh, PA

Power supply connector—If you have a defective round power connector, it can easily be replaced. Switchcraft part #15GM7M will do the job for both the 4- and 7-pin connectors, and it's usually available through electronics distributors. Here are the proper connections:

Pin 2	Yellow Wire	−5 volts dc
Pin 5	Red Wire	+5 volts dc
Pin 6	Black Wire	9 volts ac
Pin 7	White Wire	9 volts ac

Jerry Schauss
Newburgh, IN

Serial bus extenders—Radio Shack sells all the parts needed to make extension cords for the Commodore serial bus. The cables you make can be male-male or male-female, depending on whether you want to use them by themselves or add length to existing cables. The male connector is #274-020, and the in-line female is #274-021. They sell for about $1 each.

The wire for your cables can be cannibalized from the #276-1978 Joystick Extension Cord, available for under $5. Remove the D-sub connectors from either end, and you're left with ten feet of thin, flexible nine-conductor cable.

When you make up your cables, be meticulously careful that you connect pin 1 to pin 1, pin 2 to pin 2, and so forth. It's easy to become confused, so I always double-check the tiny numbers molded into the body of the connector.

The joystick wire is not shielded, so your cables may increase the RF interference from your computer. There's also a chance that extra-long cables will cause timing problems on the bus. I've used two long, unshielded cables for several months, however, and I haven't had any problems.

Louis F. Sander
Pittsburgh, PA

User port connector—Having trouble finding a 12/24-pin 0.156-inch spacing card-edge connector for your user port? This oddball size can be hard to find and expensive. A cheap substitute is to use a standard 22/44-pin connector, available for about $1 from most surplus outlets.

Use a hacksaw to cut it in half after the 13th pin. (You need to leave an extra pin so the 12th one won't fall off.) Remove the redundant 13th pin, and you have a nice connector all ready to use. If you find it difficult to remove from the user port, glue some plastic handles onto the ends.

As an added bonus, you can cut a six-pin cassette port connector from the piece you sawed off the 22/44.

Rama Viswanathan
Beloit, WI

Connector protector—If you make a cable for your user port, the 24 exposed pins on its edge connector can be easily shorted by metal objects sitting behind the computer. If you don't like to give disaster a chance to strike, cover the bare pins with the backshell from a 37-pin, D-style connector. Any backshell to which the connector attaches by screws, such as the Cannon DC 51214-1, should work. The cover not only protects the pins, but it provides a handle for inserting and removing the user-port connector.

Joel R. Robertson
Bonaire, GA

Edge connector protector—If you don't use the cassette or user port connectors in the rear of your computer, there's the danger of something touching them and shorting them out. I protect mine with a piece of plastic spine from a clear report cover, readily available in stationery stores.

Cut the spine slightly narrower than the opening in the computer's case, so it won't slide sideways once in place. To remove the protective cover, press in on one end, and the other will pivot out.

Robert Lewis
Decatur, IL

Disaster prevention—If you're charged with static electricity and touch one of the joystick ports, you can destroy an important chip inside. Since your video screen is powerfully charged with static, there's a disaster just waiting to happen.

If you put a piece of black electrical tape over the joystick ports, you will insulate them against all but the strongest static charges. The tape is undetectable, won't gum up the ports and can easily be removed when you need to plug in a joystick. It's an excellent safeguard for your computer and your wallet, and I had to learn it the hard way.

Kenny Sumrall
Sumrall, MS

Making connections—There are many sockets on the rear panel of any Commodore computer, and if you move your machine very often, you must continually match the cables with the proper sockets, while everything is out of sight behind the machine. The video and serial bus DIN connectors are very similar in appearance, which makes it difficult to distinguish between them.

I've used tape and a felt-tip marker to put connector identification labels on the top surface of my machine, just above the back panel. Now I can see where the cables belong, by just looking at the labels. With that information at hand, I can connect my cables by feel, without looking at the back panel, and with no fear of making a shocking mistake.

Kay Belle Joyner
Fitz, IN

7. Datassette Recording

Tape care tip—When you get a new cassette, you should use the fast-forward and rewind keys to run it through your recorder from end to end. This will lessen the chance that your tape will jam and/or stretch when you are using it for something important.

Nicholas Ashworth
Manchester, MI

Timesaving saves—You can make multiple copies of programs without having to babysit the computer. Just do something like this:

```
FOR J = 1 TO 3 : SAVE "programname" : NEXT
```

You can use the same trick to verify the programs you have saved. If you'd like, you can put a simple sound routine after the NEXT, so your computer will tell you when it's finished.

Robert Korpowski
Voorhees, NJ

Loading from tape—When your tape pauses after the Found message, you can end the pause by pressing the CTRL, Commodore or space keys. If you have a joystick plugged into port 1, you can do the same thing by pressing the fire-button.

Luis Daniel Martinez Calcano
Caracas, Venezuela

Selective load and run on tape—To use the shifted run/stop key on a named program, type four spaces, then your program name in quotes. Move your cursor back to the start of the line, using cursor-lefts or a shifted return plus a cursor-up. When you press the shifted run/stop key, the selected program will automatically load and run.

Steve Hedemann
Richfield, MN

Datassette audio—If your C-64 or C-128 video monitor has sound capability, you can use it to listen to your Datassette tapes. Such listening is most informative and often helps diagnose difficulties with the tape system. To do the magic, enter POKE 54296,15 then turn your volume up to max. When you load, save or verify, you should hear the tape loud and clear.

Dan Kennedy
Gearhart, OR

Finding files on tape—You can use an audio tape player to locate programs and datafiles on your cassettes. Just listen for the spaces between files and for the ten-second leader tone that signals the start of a new recording. If your player has the popular cue and review feature, you can use fast-forward and rewind to quickly locate these points.

Lon O'Bannon, III
Address unknown

Cassette directory—You can get a printed directory of all the programs on your tape by doing this:

```
OPEN 4,4 : CMD 4
LOAD"XXXXX"
```

If there is no file named XXXXX, the tape will run from end to end, with each file being listed to the printer as it is found.

Of course, you can use the same trick to get a listing on the screen—just eliminate the OPEN and CMD statements.

Danny Macpherson
Medley, Alberta
Canada

Finding load addresses—To find the start and end addresses of a program loaded from tape, print the following Peeks:

```
Start Address: PEEK (829) + 256*PEEK (830)
End Address: PEEK (831) + 256*PEEK (832)
```

To find the program name, do this:

```
FOR J = 833 TO J + 15 : PRINT CHR$(PEEK(N)); : NEXT
```

For the C-128, use the same techniques, but instead of Peeking from 829 upward, start at 2817. For the C-16 and Plus/4, start at 821 [untested].

Stefan Linnenbank
's-Hertogenbosch
The Netherlands

Direct tape reading—When a program using cassette files is troubled with errors, it often helps to see what is recorded on the tape. This routine will display the data:

```
10 OPEN 1
20 GET #1,A$
30 PRINT A$; : GOTO20
```

To verify what is being written on the tape, use OPEN 1,3,1 instead of OPEN 1,1,1. This will output the data to the screen instead of the cassette. In either case, use the CTRL key to slow down the listing.

Max W. Kuypers
Haugesund, Norway

Tape counter trickery—If your tape counter gets out of sync with your tape, you can easily locate your desired program by first loading or verifying any program on the tape. That puts your tape at the start of the next program, whose normal starting number is the key to the trick. Let's call that number the current program's normal starting number, or CNSN. If your counter showed that number right now, you wouldn't have a problem. To get to the desired program, move your tape to the counter number determined by this formula, where DNSN is the desired program's normal starting number:

```
Desired Counter Reading = Present Reading + (DNSN – CNSN)
```

If the number happens to be negative, add 1000 to it. If it's over 1000, subtract 1000.

Norman K. Creter
Cleveland, OH

Controlling tape errors—If you're working on a program and save it to tape several times with the same name, you could be asking for trouble. When you try to load it, the computer might find an old cut-off version under the same name and give you a Load error. You can usually find the "lost" beginning of your program, but it will take you several attempts. A better solution is to use a different name each time you save a version of the program.

Julie Rhodes
Columbus, OH

Bad cassette fix—If you have a cassette that suddenly refuses to load, check the felt pressure pad inside the cassette that pushes the tape against the read head. As the adhesive ages, the pad can slip out of place, even while sitting in its box.

If your pressure pad is okay, you should clean and demagnetize your record/play head. Dirty or magnetized heads are by far the most common cause of unsatisfactory Datassette performance.

Ted Hering
Redding, CA

Tape jam cure—If your tape gets jammed, there's a chance you can salvage it. Radio Shack sells cassette repair kits that include an empty cassette shell and instructions for loading it with your fouled tape. If the tape is not severely twisted, everything may be okay.

Charles Brogdon
Dalton, GA

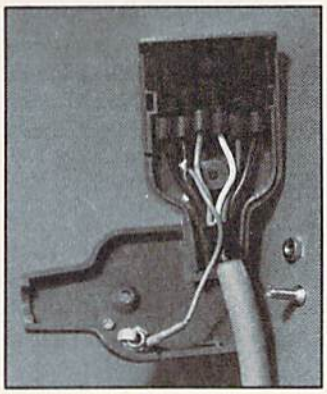
Loading problem cassettes—Sometimes a cassette program just won't load. Perhaps it was recorded commercially or on a friend's system, and the head alignments on the two recorders don't match.

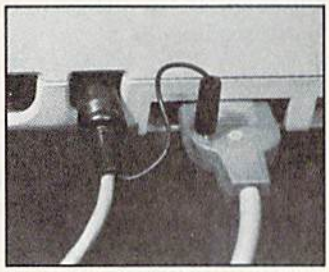
When this happens to me, I patch two good-quality audio decks together and make a copy of the offending tape. While sometimes I have to experiment with volume levels, I've never yet failed to make a new tape that loads all right. Once it loads, of course, I make a new copy on my own Datassette.

Bruce Jaeger
St. Paul, MN

Better power takeoff—To enhance your Datassette plug, open it up with a screwdriver and clip the ground

braid as short as possible. Use the space gained to install a trimmed-down submini phone jack (Radio Shack 274-292) in the upper shell. Connect the tip terminal of the jack to wire B-2 and leave the shaft terminal unconnected. You can then draw power for your printer interface with a submini plug such as Radio Shack's 274-291.





Albert W. Kuhfeld
Minneapolis, MN

8. Disk Directories

Selective directories—If you want to get a directory of all files of a certain type, you can use one of the following commands.

```
LOAD"$* = P",8—loads PRG files only
LOAD"$* = S",8—loads SEQ files only
LOAD"$* = R",8—loads REL files only
LOAD"$* = U",8—loads USR files only
```

David Lim
Pasadena, CA

Multi-selective directory—It's well known that you can load a selective directory by using something like $0:AB*, which will load a directory of all disk files whose names begin with AB. It's less well-known that you can use $0:AB*,CD* to get all those files whose names start with AB *or* CD.

You can make up to five selections at one time, and the trick works with or without the wedge. The entries for the different selections are not separated on your screen, but appear intermingled in the order in which they appear on the directory as a whole.

Lowell K. Unger
Wynyard, Saskatchewan
Canada

Harmless disk directory—Using the command Load"$",8 loads the 1541 disk directory into memory, overwriting any program that may already be there. You can avoid the overwriting by using these Direct mode commands for the C-64 or VIC:

```
POKE 44,PEEK(46) + 1
LOAD "$",8
LIST
```

When you want to return to your Basic program, just type:

```
POKE 46, PEEK(44) - 1: POKE 44,8
```

Karen Guzowski
South Burlington, VT

Directory trouble—I forgot to enter NEW after loading a disk directory, and after spending an hour typing in a program, I found I was in trouble. When the program was listed, the directory lines were interspersed with the program lines. Since the directory line "numbers," really the numbers of sectors, etc., were not in numerical sequence, they wouldn't erase in the usual way.

I solved the problem by renumbering the few program lines that were mixed in with the directory numbers and erasing the original program lines. When I relisted the program, all the directory lines appeared at the beginning, where they could easily be deleted by typing their numbers.

Richard L. Mitchell
Lafayette, LA

Directory printer—This program loads and prints a disk directory, with no keyboard input from you.

```
100 PRINT " {SHIFT CLR}{3 CRSR DNs} LOAD" CHR$(34) "$"
    CHR$(34) ",8"
110 PRINT " {4 CRSR DNs} OPEN4,4:CMD4:LIST"
120 PRINT "PRINT#4:CLOSE4 {HOME}"
130 POKE 198,5 : FOR J = 1 TO 5 : POKE 630 + J,13 : NEXT : END
```

The above is for the C-64 and VIC only. For the C-128, change line 130 to read

```
130 POKE208,5: FOR J = 1 TO 5: POKE 841 + J,13 : NEXT : END
```

For the Plus/4 and C-16, change line 130 to

```
130 POKE 239,5 : FOR J = 1 TO 5 : POKE 1398 + J,13 : NEXT : END
```

Alan Sperling, Esq.
Mount Lebanon, PA

Printed disk directories—If you set your printer on condensed pitch with a small line feed, the printed directories will be physically compact. These small printouts can be taped to the disk sleeve or put into a binder. On my Gemini printer, I do this:

```
LOAD"$",8
OPEN 4,4 : CMD4
PRINT CHR$(15) CHR$(27) CHR$(48)
LIST
PRINT#4 : CLOSE4
```

On the Commodore 1526 or MPS-802, you can get a similar effect by entering:

```
OPEN 6,4,6 : PRINT#6,CHR$(22) : CLOSE6
LOAD"$",8
OPEN 4,4 : CMD4 : LIST
PRINT#4 : CLOSE4
```

The characters won't be any smaller than normal, but the line spacing will be very tight.

George Hu
Renton, WA

Directories on non-CBM printers—Users of non-Commodore printers may have trouble printing directory listings, since the reverse-field characters in the first line can be interpreted as printer-control characters. The way around the problem is to remove the reverse-field characters.

Loading the directory, then pressing zero and the return key will delete the problem line. But your listing will have no disk name. Alternatively, leave line 0 in the directory, but replace both quotes with apostrophes or some

other character, and then hit the return key. Your printed directory should turn out all right. If problems persist, you can retype line 0 without the quotes or reverse field, and enter the corrected line by pressing the return key.

Gary Fields
Asheville, NC

Disk names—When naming disks, include the current date in the disk name. It will help you tell, for example, when you last did a backup.

Michael D. Daniels
Broomfield, CO

Disk names #2—Put your own name or initials in the disk name, and it will always be easy to tell who owns it.

Tom Hartwig
Address unknown

Disk names #3—Photo stores sell small, numbered adhesive dots for marking 35mm slides. They make good ID number labels for your disks and also provide good insurance against duplicate numbers.

Charles A. Wood
Kemah, TX

Disk names #4—One way to get unique disk IDs without having to remember titles or write them down is to code the ID to the date. Using numbers and letters, let the first letter be the month, from 1 for January to 0 for October to B for December. Let the second be the date, using a similar code from 1 through T. If you format any reasonable number of disks in a year, you won't be troubled with duplicate IDs.

Edward T. Tanton
Marietta, GA

Disk names #5—Some very odd results can be achieved by using shifted or Commodore-key characters in disk IDs. Many of them translate into Basic keywords.

Dennis C. Davis
Gray, TN

Renaming disks—The 1541 New command is capable of more than most people think. The command

```
N0:diskname,id
```

completely formats a disk, giving it the name *diskname* and the ID *id*. If you use the abbreviated command

```
N0:diskname
```

on a previously formatted disk named *diskname*, you erase all files in the directory without doing the time-consuming complete reformatting process. But if you use the command

```
N0:anothername
```

you'll also rename the disk *anothername*. It will still have its original ID, but it most surely will have a brand-new name.

Charles Lavin
Coral Gables, FL

Naming programs—I use a standard method for naming programs that involve a loader program. (These tend to be machine language programs that have a Basic loader or Basic programs where one part is loaded by another.)

If I have a two-part chess game, I name the first part "CHESS" and the second part " CHESS". Note the space before the C in the second program name.

This way, it's easy to see which programs go together when viewing the disk menu or copying programs. As an added benefit, the second program name doesn't list on the C-64.MENU program that is included on many Commodore disks.

Dave Brown
Wandering River, Alberta
Canada

Shifted spaces in filenames—Things would be easier if all disk files had short names—like M1 instead of MONITOR.49152, for example. But how do you remember the meaning of M1? If you save or rename a file using a shifted space inside the name, you can use its left portion (before that shifted space) as a normal name, while the rest of it may be treated as a comment. If you save a program as

```
"M1{shift space}MONITOR.49152"
```

the directory will list it as

```
"M1"MONITOR.49152
```

From then on, you will be able to load it as "M1", and to perform all other disk operations using that abbreviated name. If you forget, just list the directory and see the whole name. Incidentally, the DOS still considers the entire name, so these two files can coexist with no problems:

```
"M1"MONITOR.49152
"M1"MONITOR.51111
```

This is not any convenience, however, since any command aimed at "M1" will affect only the one that appears first in the directory.

Carlos A.G. de Figueiredo
Sao Paulo, Brazil

Easy load filenames—If you load programs by typing on top of a directory listed to the screen, the easy part is typing the word LOAD on top of the number of blocks to the left of the filename. It's somewhat harder to move the cursor past the filename in order to type ,8,1 or ,8: (either the ,1 or the colon removes the need to erase the PRG).

It is generally known that messages may be embedded to the right of the filename, just past the second question mark, by renaming the file and using a shifted space to separate the filename from the message. If we could put a ,8,1 message in the filename like that, we'd make it a lot easier to load the program from its directory listing. Unfortunately, the drive will not accept a comma when it renames a file.

But there is a way to put a comma there. Instead of using a comma, use a Commodore-D, the little block character that the D key makes when pressed with the Commodore key. The disk drive will accept this character, and the new directory will print it out as a comma!

For example, to embed the phrase ,8,1 after the filename MERLIN, just type the following.

```
OPEN 15,8,15 , "R:MERLIN{shift space}{COMD D}8{COMD D}
1 = MERLIN" : CLOSE 15
```

To put a colon in the filename, use the shifted @.

Doug Ferguson
Elida, OH

Encrypted filenames—You can make it difficult for others to load your secret programs by using unorthodox dummy characters to start their names. It doesn't matter which characters you use, and you don't even have to remember them, since your loading method will decrypt them automatically.

What's important is to use the same number of dummy characters each time—perhaps something in the range of 3–5. The best characters to use are those in the ranges CHR$(0) to CHR$(31) and CHR$(128) to CHR$(159). Also try CHR$(20), the delete character, which really confuses directory listings. A good example is:

```
SAVE CHR$(143)+CHR$(20)+"REAL NAME",8
```

The secret to loading such programs is to use the question mark wild-card character. If you use four dummies in naming the file, use four question marks in loading it. If you used three, use three, and so on. In our example, you would use:

```
LOAD "??REAL NAME",8
```

Cornelius Vanderbilt
New York, NY

Program load lock—If you save a program to disk using

```
SAVE "programname" + CHR$(34),8
```

it will appear in the directory like any other program named "programname." However, it can't be loaded unless you use the "programname" + CHR$(34) format. The result—nobody but you can load it!

Gary Wilson
Anthon, IA

Comma files on disk—When experimenting with disk files, simple program errors often cause difficulties with filenames. Sometimes, a file named "," pops up, which resists all efforts to be killed or renamed. When this happens, just search your directory for any other files with single-character names, then give them longer ones.

When the comma file is the only single-character name on the disk, it can be scratched or renamed by using the filename "?". The wild-card character (the ?) will match the comma and allow you to do as you wish. After the comma file has been disposed of, you can give the others their original one-character names.

Craig Brookes
Joondanna, Western Australia

9. Disk Handling and Storage

Disk-handling tip—Everyone knows it's a bad idea to touch the surface of a floppy disk or to allow it to become contaminated in any way. But not everyone realizes that the *bottom* of the disk is the side that's actually written on.

So, if you spill coffee on a disk, you might not have any problems. But if you lay it on a wet or dirty desktop, you may be asking for trouble.

Louis F. Sander
Pittsburgh, PA

Magnetic fields—We've all heard about the danger of storing your disks close to the monitor or TV. Possible magnetism could wipe out your whole library. If you worry about this sort of thing, place a small magnetic compass between the set and the proposed location of the disk box. If the magnetic field is dangerous to the disks, the needle will swing whenever it's in the field.

Jim Stephens
Nashville, TN

Dry disk storage—High humidity can cause loading problems when the felt inside your disk becomes slightly damp. You can reduce the problem by storing your disks with a desiccant capsule, such as those packed with vitamin pills. If you don't use vitamins, ask your druggist to give you a desiccant capsule.

Judith C. Fiore
Cleveland Heights, OH

But not too dry—Very low humidity can also be a problem, because it may promote static electricity, which can attract dust and even rearrange data on a disk. If low humidity is a problem, you can install a humidifier. [But see Beware of Humidifiers, in the Computer Room Hints section.—Ed.]

Ray Berg
Calumet City, IL

Disk carrier—The Rubbermaid No. 3871 five-cup Square Servin' Saver, available in most discount stores, makes an excellent storage box for disks. It is water- and dust-tight and will hold up to 25 disks. I bought mine for 99 cents.

Marty Amorin
Iowa City, IA

Disk archives—A compulsory part of anyone's disk library is the file of backup disks. For my own backup file, I used brand-new disks, appropriately named and write-protected and sealed in zip-lock sandwich bags to guard against dust and moisture. These are then put in a plastic disk box and stored in a linen cupboard, far away from magnetic fields of any sort.

Jim Lynch
Antigua, West Indies

Disk labels—To give my disks individuality and character, I remove the manufacturer's label from the upper-left corner, then hunt through magazines and other literature for suitable material to cut out and paste in its place. It's amazing what can be found to make your disks distinctive and easy to find in a file.

Ken Williams
Wahroonga, NSW
Australia

Disk labels #2—For easy identification of disks, use colored strips of electrical tape. Use different colors for each type: blue = games, red = utilities, and so on.

David Barrowman
St. John's, Newfoundland
Canada

Disk labels #3—Color-coded file-folder labels work well as disk labels, but are hard to remove. To make removal easier, apply a 4-inch length of Scotch Magic Mending Tape to the disk, then apply the file-folder label to the tape.

Stanley Beck
Chalmette, LA

Disk labels #4—I use sticky-back shelf paper, available in a variety of colors. The shiny ones accept printing from my Okimate printer.

David F. Hiestad
Seattle, WA

Disk labels #5—To label my disks, I use the silver or gold markers available in office supply stores for about $2. The ink is like paint, and I write directly onto the disk jacket.

David J. Todeschini
Richmond Hill, NY

Disk labels #6—To more readily identify different categories of disks, place the labels in different positions across the top of the disk. This helps you organize and find them.

If there's not enough room on the label, put another label on the back of the disk. That's where I record special instructions such as printer and interface settings.

Karl Thurber
Millbrook, AL

Inexpensive disk mailers—To make my own disk mailers, I cut two squares of corrugated cardboard slightly larger than a disk and its envelope. Then I put the disk between them, making sure the corrugations on the two pieces run at right angles to each other. When I tape the four corners, the resulting sandwich is strong, light and compact, and can be mailed in any envelope large enough to hold it. Photographers have used this method for years, and their valuable prints are seldom damaged in the mails.

Alan Sperling, Esq.
Mount Lebanon, PA

Disk mailer—Having trouble with disks getting bent in the mail? Get a six-inch square of styrofoam insulation about one inch thick, put your disk on top of it and wrap it in brown paper. The package is bend-resistant beyond belief, and the styrofoam is so light that it doesn't add to the cost of the postage.

Brian Gasperich
Houghton, MI

10. Disk Operations

Disk load and run—If your shifted run/stop key loads and runs programs from tape, here's a way to load and run a program from disk with the fewest typing strokes. Just type:

{CLR}{4 SPACEs} "filename",8: {HOME}{SHFT RUN/STOP}

The program comes up running.

John K. Newell
San Antonio, TX

Loading "*"—When you enter LOAD"*",8 with your Commodore disk drive, you don't always get the first program on the disk. Usually, in fact, you get the last program you've accessed. To fix this, just insert a colon in front of the asterisk:

```
LOAD":*",8
```

This gives you the first program every time.

Brian Kennedy
Colorado Springs, CO

Estimating program lines—It's useful to be able to estimate the number of lines in a program when you have to print out a listing. Depending on a program's compactness, each disk block holds about 8–10 lines. Therefore, a program that occupies 30 disk blocks probably has 240–300 lines, or about five pages.

Peter T. Crosby
Claremont, NH

Disk copying tip—When making a copy of disks, using the programs that require switching source and destination disks, it is a good idea to put a write-protect tab over the window of the source disk. It provides extra protection against accidental erasing of the source material.

Larry Thomas
Hooks, TX

Disk-save command quirks—If you type

```
SAVE"PROGRAM",8
```

you will get "PROGRAM" PRG in the disk directory. If you type

```
SAVE"PROGRAM,S",8
```

the directory will show "PROGRAM" SEQ, and the program won't load unless you enter LOAD"PROGRAM,S". If you save it as "PROGRAM,U", it will similarly show up as "PROGRAM" USR in the directory, and must be loaded as "PROGRAM,U".

You can use these quirks in several ways. If, for instance, you save a program whose name ends in ",S", you give it a modest amount of security from being loaded by others. Only those in the know would think of trying to load what appears to be a SEQ file. Or, if you make it a habit to end machine language program names with ",U", the USR in the directory will be your clue that they must be loaded with ,8,1 or BLOAD on the C-128. The clue is a good one, since Radio Shack and some other computers reserve the USR designation for machine language files.

Eddie Lyons
Bronxville, NY

Appending to files—There is a command that can be used on the 1541 disk drive to add data onto an existing sequential file.

```
200 OPEN 3,8,3,"0:FILENAME,S,A"
```

The A stands for append; for some reason, this command is not in the owner's manual for the 1541.

Keith Marshall
San Juan, Trinidad

Commodore 1571 caveat—The new 1571 disk drive has many marvelous features, not the least of which is its ability to write on both sides of the disk. But if you've been notching your floppies for two-sided recording on a single-sided drive, be careful. When you use the 1571 to reformat those disks (or any others), it will automatically reformat both sides, even if you've write-protected your extra notch. If you aren't aware of that aspect of double-sided recording, you could unexpectedly wipe out a flip side.

William W. Weaver
Saxton, PA

2040/4040 disk drives—If you use one of these units, you may have trouble loading software written for the 1541, even though the disk formats are compatible. It sometimes helps if you put the 1541 disk in drive 0 and put another formatted disk in drive 1. If the program still doesn't load, it's because the manufacturer used a protection scheme that depends on the frailties of the 1541 drive.

Bruce Jaeger
St. Paul, MN

Disk error light—If your disk drive's red light starts blinking, some sort of disk error has occurred. If you have a C-128, Plus/4 or C-16, type PRINT DS${return}. If you have the wedge in memory, type @ {return} to find out what type of error occurred. Otherwise, enter and run the following line.

```
10 OPEN 15,8,15 : INPUT#15,A$,B$,C$,D$ : PRINT A$,B$,C$,D$ :
   CLOSE 15 : END
```

You cannot enter this in Direct mode, because the Input# statement is only valid in a program. You can use any line number you want, and there's no reason to destroy any program you already have in memory. Merely enter the line with an unused number XXX, then type RUN XXX {return}. Delete XXX after it's done its work.

The message you get will consist of an error code, error name and the track and sector on which the error occurred. Often the error name is enough to tell what happened, but the error code can be helpful, too. Your 1541 operator's manual includes a most informative listing of error codes.

Mark Blayney
Darwin, Northwest Territory
Australia

Disk hang-up fix—Sometimes disk drives, especially the older ones, seem to disregard your commands from the keyboard. When this happens, try simultaneously pressing the run/stop and restore keys. Chances are, the hang-up will end immediately.

Eric Haver
Pittsburgh, PA

Disk doctor—Do you have a disk that absolutely will not format properly? Try erasing it with a bulk eraser of the kind used to erase magnetic tapes. I have used this trick to reclaim several disks of the bargain variety.

During this process, be sure to keep the disk in its protective envelope to lessen the possibility of contaminating it. Don't worry—the magnetic field will go right through the protective envelope.

Scott Bouslog
Muncie, IN

11. Hardware—General Hints & Tips

Equipment turn-on sequence—Much has been written about the proper order in which to turn your computer and peripherals on and off. All sorts of disk hangups and printer problems are involved, and it's difficult to find the best turn-on sequence for every situation.

I struggled with these problems for years before discovering that if a reset button is connected to the serial bus, turn-on sequence doesn't matter. If you turn everything on, then press your reset button, the problems magically disappear. Apparently, the reset button causes the serial bus to normalize all the peripherals, regardless of when they have been turned on. This interesting experience represents one more reason to install a reset button on your computer.

Karl T. Thurber, Jr.
Millbrook, AL

Travel tips—When you travel with your computer, always take along a good extension cord and a three-prong adapter for the ac wall socket. It's not a bad idea to take a multi-socket power strip, either, just in case you run out of outlets.

R.W.P. Patterson
Stone Mountain, GA

Burning in—A fact of life in modern electronics is that if a newly assembled piece of equipment is going to fail, it will likely do so very early in its operating life. A common practice to ensure future reliability is to "burn in" new equipment—that is, to leave it powered up for some period after initial assembly and testing and to check whether it continues to function normally.

Whenever you get a new piece of equipment, it's a good practice to burn it in yourself. Leave it energized around the clock for the first week or so that you own it. It doesn't have to be doing anything; it just needs to be turned on. Of course, you should use it from time to time, just to be sure it's still functioning correctly. If something is going to fail, it will likely fail during this burn-in period. Burning-in has three main advantages to you.

First, you will have put on enough hours during the warranty period to decrease the likelihood of later failure. Second, you will have done so soon enough after purchase that you can take your unit back to the retailer, rather than sending it to Commodore or a service center. Third, you will have a reasonable degree of confidence in the reliability of your computer.

Greg Kundert
Detroit Lakes, MN

Contact cleaning—Have you ever had a train set where the train goes dead in the middle of a piece of track? Train hobbyists know that's an indication the track needs cleaning.

Similar problems occur with computers that use plug-in cartridges and other peripherals. Usually what needs cleaning is the brass fingers on the printed curcuit board that plugs into the female edge connector. (The female edge connectors themselves are made to be self-cleaning and highly reliable. They are also very delicate, so you should keep your fingers out of them.)

A pencil eraser is a very good tool for cleaning these brass or solder-covered fingers.

Tim Thompson
Boston, MA

Keyboard maintenance—I ended up with some orange juice in my C-64 keyboard, and the keys stuck down like they were glued. Since I had been playing adventure games (thereby building courage, character and other powerful attributes), I decided to clean it up myself. It was easy.

Three screws get you into the 64. To remove the top assembly, you must unplug two connectors—one to the LED power light and the other to the keyboard. Just pay attention to which end is which and work with a gentle touch, and you'll have no trouble taking them off or putting them back on.

Take out all the little screws, and the keyboard assembly will come off. You need to de-solder or cut one wire to the shift-lock key. You can solder it back on when you're done, or just live without shift lock in the future.

Use alcohol and a paper towel to gently wipe off the printed curcuit board inside the keyboard. Be careful not to put too much pressure on the membrane that the keys touch. I put the keyboard in the sink and washed it with soap and water, then dried it with a hair drier set on low heat.

When you're finished cleaning your keyboard, reverse the disassembly process, and everything should be as good as new.

James Roberts
Central Valley, CA

12. Joystick Port Peripherals

Non-Commodore joysticks—Atari or Coleco joysticks will work just fine with your Commodore computer, as will many other brands. If in doubt, try them out.

William Saunoris
Mokena, IL

Joystick identifiers—The cords on my two joysticks are always getting tangled, so I don't know which one is which. I solved the problem by putting two pieces of masking tape on one of the joystick cables—one at the connector end and the other up near the joystick.

Mick Barrowman
St. John's, Newfoundland
Canada

Fix stix—When your joystick stops working, it's likely you can fix it yourself. Just open it up and make sure all the connections are sound and that everything is lined up mechanically. It's surprising how often you can see and fix the problem.

Joe Buckshaw
Holbrook, NY

Cable repairs—If your Atari 2600 joystick cable is defective, you can buy a replacement for less than the cost of a new joystick. You can replace it yourself if you keep careful notes on which colored wire goes where. Be careful not to lose the fire-button spring.

Jim Smith
Bowling Green, KY

Fire-button fix—If your joystick's fire-button is ready for the big arcade in the sky, you might be able to give it a new lease on life. Try replacing the fire-button spring with a section of spring from an inexpensive ballpoint pen.

Phil Dietz
Omaha, NE

Left-handed joysticks—The standard Atari joystick has its fire-button on the left side, making it inconvenient for left-handers to reach. By making some easy wiring changes, you can make the joystick suitable for lefties.

Remove the screws from the bottom of your joystick and observe the six wires attached to the unit by removable connectors. The original wiring follows the order: brown, white, black, blue, green, orange. To get the "lefty" modification, rearrange the order as follows: blue, brown, black, green, white, orange. Notice that the connectors are very easy to change and that you have to move only four wires.

When you've made the changes and screwed the joystick shut, just turn the lefty joystick so the fire-button is on the right side.

Al Degutis
Chicago, IL

Which port?—By adding this subroutine to your C-64 programs, you will be able to use your joystick in either port. Pressing the fire-button will tell the computer which port the joystick is using.

```
10 PRINT "PRESS FIREBUTTON TO START..."
20 IF (PEEK (56320) AND 16)< >16 THEN PO = 56320 : GOTO 50
30 IF (PEEK (56321) AND 16)< >16 THEN PO = 56321 : GOTO 50
40 GOTO 20
50 Rest of program starts here
```

Alexei Gilchrist
Rotorua, New Zealand

Reading the joystick—Some books do not give clear examples of how to read a joystick. They provide a long program to do a difficult job that you care nothing about for the time being. After a lot of frustration, I wrote this simple program for reading a joystick in port 2. To read port 1, set PO = 56321 instead of 56320.

```
100 PO = 56320
110 H = ((PEEK(PO)AND4) = 0) - ((PEEK(PO)AND8) = 0)
120 V = ((PEEK(PO)AND1) = 0) - ((PEEK(PO)AND2) = 0)
```

→

Listing continued.

```
130 B = ((PEEK(PO)AND16) = 0)
140 IF H = 1 THEN PRINT "RIGHT"
150 IF H = -1 THEN PRINT "LEFT"
160 IF V = 1 THEN PRINT "DOWN"
170 IF V = -1 THEN PRINT "UP"
180 IF B THEN PRINT "BANG!"
190 GOTO 100
```

Terry Zembrzuski
Address unknown

Paddle improvements—When using paddles from the Atari 2600 game system, it is possible to reduce jitter and optimize the range of the paddle by connecting a 1 megohm trimmer (Radio Shack #271-229) in parallel with the paddle potentiometer.

Using the program below, with the paddles in port 1, turn the paddle clockwise until it stops, then adjust the trimmer so the value on the screen is 254. Repeat for the second paddle.

```
10 PRINT "{SHFT CLR}";PEEK(54297),PEEK(54298) : GOTO 10
```

C.F.
Throop, PA

Better paddle Peeking—There is a misconception that paddles cannot be reliably read from Basic on the C-64. But it's easy to do, if you disable the keyboard while you're reading them. This line will do the trick for paddles plugged into port 1. For port 2, change the 64 to 128.

```
10 POKE 56334,0 : POKE 56320,64 : X = PEEK(54297) :
   Y = PEEK(54298) : POKE 56334,1
```

Andrew Bedno
Chicago, IL

KoalaPad tip—If you have the KoalaPainter, you've probably discovered that you can't save both screens. However, you can load both screens. Here's how.

Load one screen normally, then use the Swap option. Load again using any other picture. Now both pictures are in place, and the push of a button will swap the screens back and forth. This is handy for comparisons and should work on any Koala cartridge that has the Swap command.

L.K. Simmons
Riverside, CA

KoalaPad programming—Many people have the KoalaPad, but never use it except for drawing pictures. This fine peripheral can be used for many other purposes and looks like a game paddle when plugged into the computer. To read the X-Y coordinates of the stylus when your pad is in port 1, simply Peek locations 54297 and 54298.

Marvin Green
Corvallis, OR

KoalaPad buttons—By Peeking memory location 197 on the C-64, you can tell if the KoalaPad's buttons have been pressed. The result will be 59 when the right button is down and 50 when the left button is down. Other numbers mean no Koala button is down.

Randy Batt
Haysville, KS

Lazy light pens—Before you give up on your light pen, try cleaning your TV screen with an antistatic cloth. It keeps dust from collecting on the screen and keeps the screen from zapping your pen. My light pen improved dramatically after this treatment.

Unknown contributor

Light pen checkout—Some inexpensive light pens give inadequate resolution along the X-axis of the screen display. The program below Peeks the contents of the light pen registers. Even though the pen may be perfectly still on the screen, some pens show a variation of as many as five units in successive samples of the X position.

To test your own light pen, plug it into port 1. Run the program and try to read the Xs with your pen.

```
10 PRINT PEEK(53267),PEEK(53268), "X.X.X.X.X.X.X.X.X"
20 FOR J = 1 TO 500 : NEXT : GOTO 10
```

Fred Jestaedt
Mitchellville, MD

13. Keyboards and Keyboarding

Read the key labels—The labels on your keys will tell you what they do. The so-called CLR/Home key moves the cursor home when unshifted, but clears the screen when shifted. The clue to that fact is that Home is below CLR on the keybutton label. Other keys work similarly, for example run/stop and INST/DEL. By the way, the proper name for that key is *Insert*/Delete, *not* Instant/Delete.

Louis F. Sander
Pittsburgh, PA

Special keys—Everyone is familiar with the shift key on a typewriter—it shifts the mechanism only while it is depressed. The idea is to push shift before pressing any other keys, and to release it only when you're finished with it. On your computer, the SHIFT, CTRL (or Control) and Commodore Logo keys all work in just that way. Be sure they are pressed before and during your activity with the other keys involved.

If your computer has an ESC (or escape) key, you should be aware that it does *not* work in the same way. You must *press and release* ESC before pressing the other key or keys involved.

Louis F. Sander
Pittsburgh, PA

Touch assistance—Touch-typists sometimes have difficulty placing the fingers on the home keys without looking at the keyboard. I have found that putting small pieces of cellophane tape on the F and J keys makes it very easy to find them. Others have used clear nail polish or Elmer's glue. The idea is to find something that makes the key feel slightly different, but that can be easily removed in the future.

Mark Bersalona
Philadelphia, PA

Keyboard overlays—When using complex programs like Easy Script and Simons' Basic, the function keys, and usually others, have many hard-to-remember purposes. Cardboard overlays for your keyboard can make it easier to use these programs.

Get pieces of thin cardboard from a stationery store or shirt laundry, then measure the dimensions of your computer and its keyboard area. Cut the cardboard to fit your computer, then cut out places for the keyboard areas. When you put the overlay in place, your keys will be surrounded by cardboard on which you can write the instructions appropriate to your program. If you own several complex programs, it's easy to make an overlay for each.

Mary D. Brigito
Old Forge, NY

Better overlays—I use Scotch Post-It notes to label my function keys. The 3½- × 5-inch size is best, but several sizes are available. If you prefer cardboard overlays with cutouts, try the omnipresent 3- × 5-inch index cards.

Jerry Rush
Address unknown

Basic abbreviations—You can fit many statements onto one program line by using the abbreviations in the appendix to your user's manual. When the line is listed, the keywords are printed out in full, so your program line might take up more than the usual number of screen lines.

This is no problem, but if you try to edit the long line, your computer will cut it down to normal program line size. So use abbreviations to pack the statements into a line, but be very careful when editing it later.

And speaking of abbreviations, please remember that you cannot use a question mark in abbreviating the Print# command. The correct abbreviation for Print# is P{shift R}, which Basic stores as token number 152.

If you try to abbreviate PRINT# as ?#, it will be tokenized as 153 (the token for Print), followed by 35 (the token for #). That will give you a Syntax error instead of a Print#.

Debbie Billeter
Phoenixville, PA

Direct mode colons—In Direct mode, colons can be used in entering several commands on one line. It saves time, as you don't have to wait for the execution of individual commands. For example:

```
OPEN15,8,15 : PRINT#15 : "S:TEST" : CLOSE 15 : LOAD "$",8 : LIST
```

This one line tells the computer to open the disk command channel, scratch the file named "TEST", load the directory, then list it. You can save even more time by abbreviating the keywords.

Pat Fenceroy
Dallas, TX

Type it anywhere—When using commands such as RUN, LIST and CONT in the Direct mode, it is not necessary to type them starting in the left-most margin. They can be entered anywhere on a line by themselves.

In fact, *any* line can be entered in that way. Not only that, but the cursor's position doesn't matter, either. As long as it's on the same screen line as part of what you're entering, you can press the return key, and your line will be entered perfectly. Try it—it works!

R.V. Taylor
Little Rock, AR

Editing in color—When editing a listing on the screen, it makes things easier if you change the color of your cursor before making your edits. If the listing is in blue on blue, for example, press CTRL 2 to change the cursor to white, then make your corrections. The changes will stand out on the screen, making it easy to see the results of your work.

Meredith Jones Frummer
Riverdale, NY

Quote mode—Commodore computers go into the so-called Quote mode whenever an odd number of quotation marks have been typed. In Quote mode, cursor and color keys do not have their normal effect, but instead print reverse-field characters to the screen. When included in Print statements, those reverse-field characters translate back into the keystrokes that created them. It's all very useful; if you don't understand it too well, experiment until you do.

There's another way to get into Quote mode: When the insert key is used to open up spaces in a line, those spaces behave as though they are in Quote mode. That knowledge is useful if, for example, you need to insert a cursor control into an existing Print statement.

It's often desirable to get out of Quote mode, but the means to do so are not always obvious. You can try the following.

- Type another quotation mark. (You can then delete it, if you'd like.) This doesn't always work on inserted spaces.
- Press the return key. This, of course, enters your line into the computer, which may or may not be what you want.
- Press the shift and return keys together. This does not enter your line into the computer.
- Use an escape sequence. On the C-128, use ESC C. On the Plus/4 and C-16, use ESC O.
- For inserted spaces only, use your space bar to move over the inserted spaces.

Cindy de Roulhac
Pittsburgh, PA

Disaster relief—Have you ever typed over a program line by mistake, then changed your mind before entering it? If so, you're familiar with the panic that sets in when you try to remember what the line looked like before you ruined it.

In this case, relief is spelled s-h-i-f-t-e-d r-e-t-u-r-n. Simultaneously press the shift and return keys, then list the line again. You'll see it in its original form.

Mike Whittingham
Fanwood, NJ

Reclaiming erased programs—If you accidentally erase a program from memory when using the New command, there's an easy way to reenter it without retyping, *if* the program is still listed on the screen. Just move your cursor onto any part of the first line, then press the return key. Repeat the process for the other lines on the screen

(except for NEW), and your program will be reclaimed (prove the fact by listing the program). The trick works well for the short programs that beginners practice on, since many of them can be listed in less than a whole screen.

Douglas Shepherd
Addis Ababa, Ethiopia

Combining two lines—It's easy to combine two program lines into one, if they're both short enough, and *if* you know the magic. Here it is:

1. List the higher-numbered line onto the screen.
2. Type spaces over its line number, then insert spaces until the text stops moving.
3. Press shifted return, then move the cursor up to your original List command.
4. Change the line number in the program listing to the number of the other line you're interested in (the lower-numbered of the two).
5. Press the return key to list the line. The two lines will now be together, with spaces between them.
6. Delete these extra spaces, and put a colon between the two former lines.
7. Press the return key to enter your new line.
8. Delete the former second line, which is, of course, still in memory.

This trick will only work if the total length of the two lines is less than the maximum length allowed by your computer's screen editor (80, 88 or 160, depending on your computer). Some space can be gained by abbreviating commands on the bottom line before listing the top line.

Richard D. Stueven
Lincoln, NE

Escape literature—Many printers require the ASCII escape character, CHR$(27), to be sent as part of various control sequences. Some Commodore computers don't have an escape key, and there's nothing in the documentation to show how one can be rigged. Fortunately, the matter is easily resolved, since pressing {CTRL : } generates an escape character.

If the computer is in Quote mode, a reverse-field left bracket will come up on the screen, and when that character is printed, the escape code will be sent. If your printer is open to file #4, an escape can be sent to it by entering:

```
PRINT #4,"{CTRL : }"
```

Of course, {CTRL :} means to hold down the control key, then hit the colon.

Mrs. Deane Maddocks
Glenwood, IA

Generating CTRL characters—Sometimes, especially when working with printers or telecommunications, it is required to generate a CTRL S or other similar character. While the CTRL characters are very common in the computer world, Commodore computerists don't see them too often.

The CTRL characters are CHR$(0) through CHR$(31), and in the standard non-Commodore ASCII nomenclature, each one has a name, albeit a cryptic one. On non-Commodore computers, these characters are generated by pressing CTRL and another key.

Many Commodore computers can generate these characters in the same way, as illustrated in the table below. Several of the characters have their own Commodore meanings; some can also be generated by other keys and some cannot be generated as shown, depending on which Commodore machine you're using. However, by and large, the table is accurate for Commodore use, and you should try it when you need to send a CTRL character.

NAME		KEY		CHR$	HEX
NUL	=	CTRL @	=	0	$00
SOH	=	CTRL A	=	1	$01
STX	=	CTRL B	=	2	$02
ETX	=	CTRL C	=	3	$03
EOT	=	CTRL D	=	4	$04
ENQ	=	CTRL E	=	5	$05
ACK	=	CTRL F	=	6	$06
BEL	=	CTRL G	=	7	$07
BS	=	CTRL H	=	8	$08
HT	=	CTRL I	=	9	$09
LF	=	CTRL J	=	10	$0A
VT	=	CTRL K	=	11	$0B
FF	=	CTRL L	=	12	$0C
CR	=	CTRL M	=	13	$0D
SO	=	CTRL N	=	14	$0E
SI	=	CTRL O	=	15	$0F
DLE	=	CTRL P	=	16	$10
DC1	=	CTRL Q	=	17	$11
DC2	=	CTRL R	=	18	$12
DC3	=	CTRL S	=	19	$13
DC4	=	CTRL T	=	20	$14
NAK	=	CTRL U	=	21	$15
SYN	=	CTRL V	=	22	$16
ETB	=	CTRL W	=	23	$17
CAN	=	CTRL X	=	24	$18
EM	=	CTRL Y	=	25	$19
SUB	=	CTRL Z	=	26	$1A
ESC	=	CTRL :	=	27	$1B
FS	=	CTRL 3	=	28	$1C
GS	=	CTRL ;	=	29	$1D
RS	=	CTRL 6	=	30	$1E
US	=	CTRL 7	=	31	$1F

Tim Johnson
Houston, TX

CTRL character tips—Sometimes when a program has finished, the shift/Commodore keys are still disabled, so you can't change character sets. The easy way to enable them again is to type CTRL I. This is a shorthand way of printing CHR$(9), which enables character set changes.

Also, instead of using CTRL RVS, try using CTRL R. It has the same effect and is a lot easier to reach.

Stephen Shapiro
Portland, ME

Program indentation—If you've ever tried to indent your program lines to clarify program structures like For...Next, you've seen that Basic removes all leading spaces. You can override this by entering POKE 129,1. That little Poke causes the C-64 or VIC to remove CHR$(1)'s instead of spaces!

The trick works in Program mode, but it affects Direct mode, too, because it prevents you from using spaces inside your commands. If you use them, you'll get a Syntax error. To return things to normal, enter POKE 129,32.

You can have more fun with this by Poking other

character strings into 129. If N is the number Poked, the computer will delete any CHR$(N) you try to enter in a program or Direct mode line.

Gustavo A. Tolosa A.
Mexico City, Mexico

Vanishing variables—Shift your computer into Lowercase mode, then type in the following program (you'll have to shift to get the uppercase letters).

```
10 DATA XYZend
20 N=5
30 READ N$ : PRINT N,N$
```

Now run the program and observe that the computer ignores it completely. List the program, and notice that not much of it remains. The moral is to be cautious when typing in Lowercase mode, since your computer ignores shifted letters unless they are in quotes. Use only unshifted letters for commands and variables, or some very strange bugs may appear.

Marion Maddocks
Glenwood, IA

Easy RUN—When typing RUN to start a program, you need not move your cursor to a blank line, and you need not clear your screen. Just type a colon after the RUN, then press the return key.

Robert Train
Patchogue, NY

Easier RUN—When there's a program in memory and the Ready prompt is on the screen, just put your cursor on the Ready and press shifted run/stop. It will automatically run your program. The technique works with any non-executable text line on the screen, so if you don't have a Ready prompt, just type some garbage, then press shifted run/stop.

John Schroeder
Westville, NJ

Easiest RUN—You can run a program just by simultaneously pressing the shift key, space bar and question mark key. All three are clustered together and can easily be pressed with one hand.

Tim Harris
Fox Point, WI

RUNDY—Have you ever typed in RUN over READY? If you have, the computer probably printed the familiar Undef'd Statement error. But, on many Commodore models, if your program starts with line number zero, it will run no matter what follows RUN on the screen.

Tim Brugman
Fullerton, CA

Reset curiosity—When powering up or resetting, hitting the restore key will bring the system to a halt. The computer won't be able to continue, as evidenced by the shrunken border that persists until you reset the system again.

Craig Johnson
Juneau, AK

14. Modems and Telecommunications

Telecommunications library—A world of information on this fascinating field is available at your local Radio Shack. Three excellent books cover the subject as well as you're likely to want.

Understanding Telephone Electronics explains all aspects of the telephone network, from telephones to transmission lines to central office equipment; *Understanding Data Communications* tells, in easy-to-read technical detail, how data is transmitted over that network; and *Installing Your Own Telephone* gives the nuts and bolts of residential telephone installation, including step-by-step instructions.

All three books are inexpensive and easy to understand. Buy them, read them, then donate them to your local public library.

Mary Lee McCafferty
Butler, PA

Reliability aid—When a Commodore 1600 or similar modem is plugged into the user port, it doesn't rest solidly on the desk behind the computer. When pressure is applied under these conditions, the modem moves slightly, and connections are momentarily broken, leading to loss of communication. If you put a pencil or similar object under the modem, you'll eliminate the problem.

Leonard R. Faucett, Jr.
Denver, CO

Phoneless modem—The manual for the Commodore 1650 modem implies that you need a modular telephone to use the 1650. But all you really need is access to a modular phone line—you can get by without the telephone!

Just use the 1650's auto-dial feature to make your calls, and be sure to move the T-D switch to T when the modem isn't in use. If you forget to move it to T, the phone will remain off the hook, tying up your line until you discover it.

Reginald E. Darby
Buffalo, NY

Easy modem upgrade—I have an easy way to improve the operation of the 1600 or any other modem that connects to the handset cord. I get a two-way modular adapter plug and a $5 electronic phone. (The cheap ones don't have modular handset cords.) The adapter plug plugs into the wall, and, in turn, the electronic phone and my desk phone (with modular handset cord) plug into it. The desk phone stays constantly plugged into the modem, with its handset (unconnected) on the hookswitch, keeping the line dead. The electronic phone, of course, also remains off-line.

When the time comes to telecommunicate, I pick up the electronic phone and use it to make the call. When I hear the carrier, I lift the handset from the desk phone and hang up the electronic one.

This low-cost system lets me get on-line with a minimum of hassle and without having to plug and unplug a handset cord.

Daniel R. Zoll
Brookline, MA

Multi-line modem—Business users usually dedicate a special single line for telecommunications, because few business phones are equipped with modular jacks. But Radio Shack's 43-233 Modular Multi-Line Controller lets you connect your modem to most five- or ten-button telephones.

It provides a modular jack for your modem, plus buttons to switch it to any one of five lines. The unit connects between the halves of your telephone's Amphenol connector and can be installed in less than five minutes.

James F. Ritterbusch
Missisauga, Ontario
Canada

Don't auto-dial—If you have an auto-dial modem, the auto-dial feature is often more trouble than it's worth, since it takes so long to dial, then waits forever to hang up if the line is busy. To save time, dial with the phone plugged into the modem. If the line is busy when you call, you can hang up immediately. And if your telephone has the re-dial feature, you can use it when you place the call again.

Tim McVeigh
Lockport, NY

Modem intercom—This little trick has helped solve many modem problems. If you have two computers and two modems, you can get them to talk to each other over two phones on one line in your home. With both ends of the link in one building, troubleshooting becomes a snap.

Simply pick up the phone and wait for the loud beeping to stop. It will take a minute or two, but it will eventually stop. Plug that phone into your modem (or switch from T to D if you have a 1650). Then pick up an extension phone and do the same for that. You should now be able to converse between two computers on a single line!

Mike Mann
New Smyrna Beach, FL

Modem intercom revisited—If you tried the above trick, but the dial tone never went away, you have an older switchboard on your local telephone network. Dialing the first digit of your own telephone number should get rid of the dial tone for you.

These old systems also cause a lot of errors while telecommunicating. If you ask your operator to make your call for you, chances are good that you'll get a better connection.

Mike Handy
Middletown, OH

Dummy modem—If you're trying to correct modem problems, learning to telecommunicate or debugging your own terminal software, there's an easy, low-cost way to go on-line. Get a friend to bring his computer and modem over, then connect your modems directly together, completely bypassing the telephone system. You can use any modular extension cord for this purpose, including the one that connects your own telephone to the wall.

You'll have to ensure originate/answer compatibility between the two modems, but that can be as simple as flipping a switch. (One modem must be in Originate mode, and the other in Answer mode.) Once you are in communication, this system completely eliminates phone-line problems. And having both terminals in the same room gives wonderful feedback to the operator, since keyboard entries on one can be viewed immediately as they are received and displayed on the second.

Chuck McGaffin
Ballston Lake, NY

Call waiting—If you have the call-waiting feature on your telephone, incoming calls can disrupt communications over your modem. Here's a simple way to disable this feature while you're computing. Prior to going on-line, just dial a 9 on your telephone, push the hang-up button once, as you would if answering a call-waiting signal, then dial the number for your computer call. Anyone trying to call you will simply get a busy signal until you complete your computing session, and the phone will resume its normal status when you log off your system.

W.L. Cochran
Green Cove Springs, FL

More on call-waiting—Call-waiting is implemented differently by different telephone companies, and no one method will work in all parts of the country.

Here in southern Wisconsin, you dial *70, wait for the dial tone, then dial your own number. Anyone trying to call you then gets a busy signal until you complete your call. As soon as you hang up, the *70 is disabled, and you have the normal call-waiting feature available again.

If you need information on this subject, the best thing to do is call your local telephone company. If you ask to speak to a switching foreman or a repair foreman, the chances are you'll find somebody who can help you. But, if at first you don't succeed, try, try again.

Walt Grosch
Milwaukee, WI

Cheap terminal program—The following one-liner will serve as a terminal program for any RS-232-compatible Commodore computer.

```
10 OPEN 2,2,0,CHR$(6):FORT = 0TO1STEP0:GET#2,A$:PRINTA$;:
   GETB$:PRINTB$;:PRINT#2,A$;:NEXT
```

CHR$(6) sets the modem to 300 baud, eight-bit word length, one stop bit, no parity, and three-line handshake. Consult your *Commodore 64 Programmer's Reference Guide* for other settings.

The program will allow excellent communications between Commodore machines, but, since there is no ASCII conversion, you may have trouble with some characters on other systems. Also, there is no cursor to indicate where you will type next. If every key prints two characters instead of one, delete the PRINTB$ statement. When you use the program, of course, one modem must be in Originate mode and one in Answer mode.

Todd and Troy Andrews
Wilder, VT

Better translation tables—Terminal emulator users may want to make the following changes in their keyboard translation tables. They work with the Smart 64 Terminal

+2 and should work with most others unless the keys are assigned a special function by the program. In our table, C > A means that the Commodore ASCII value C is translated to the standard ASCII value A for transmission. C < A means that the received standard ASCII value A is translated to the Commodore ASCII value C.

29 > 19 makes the unshifted cursor-right key send a CTRL S to stop host transmission. (An unshifted cursor-down key already sends CTRL Q to cause the host to resume.)

147 < 12 converts the host's form-feed to a clear screen command.

141 < 10 converts incoming line feeds to shifted returns, giving double-spaced copy if the host sends line feeds.

20 > 127 makes the delete key send a true delete, rather than a CTRL H.

145 > 123 and 157 > 125 make the shifted cursor keys send left and right curly brackets.

123 > 123 and 125 > 125 cause left and right curly brackets to be displayed on screen as a cross and a vertical bar, respectively. Your computer can't display braces directly, but they will be printed normally if you use a standard ASCII printer.

Fred Burch
Gainesville, FL

15. Power Supplies

Hot power supplies—Even when your computer is turned off, your power supply draws enough current to keep itself unnecessarily warm, which is a condition leading to early failure. Prevent the problem by plugging your computer and all its peripherals into a switched multiple outlet strip. Then use the outlet strip's switch to turn your system on and off.

Joseph Bober
Brooklyn, NY

Spike protection simplified—Instead of buying spike protectors for each of your computer units or buying an expensive surge-protected power strip, plug a small voltage spike protector between your present outlet strip and its source of ac power. The widely available GE VSP-91D is rated at 15 amps, which is more than enough for a large Commodore installation and can be bought for about $6.

R.E. Duderstadt
Cincinnati, OH

On overheating—A common symptom of an overheated power supply is a screen full of crazy characters. This symptom often arises just before a power supply failure. If you experience this problem, temporarily substitute a borrowed power supply for your own. If the problem goes away, your power supply is probably defective.

Joseph H. Toy
Jackson, TN

Heat sinks—My power supply got hot on the ends. To fix it, I used Duco liquid solder to glue two aluminum heat sinks to each end. Radio Shack 276-1363 heat sinks are less than a dollar each, and they cured my overheating.

Garold R. Stone
Annapolis Junction, MD

Fuses—There are two glass fuses in most Commodore computers, and if your power supply seems dead, you ought to check them out. The first one is inside the computer and can be easily seen when you open up the machine. The second is inside the power supply. To reach it, use a screwdriver and hammer to remove the bottom of the power supply itself. The fuse is soldered into place, so repairing it is best left to someone experienced in electronics. Make sure you unplug the unit before trying to open the case—high-voltage connections will be exposed inside.

Robert Croswell
Trappe, MD

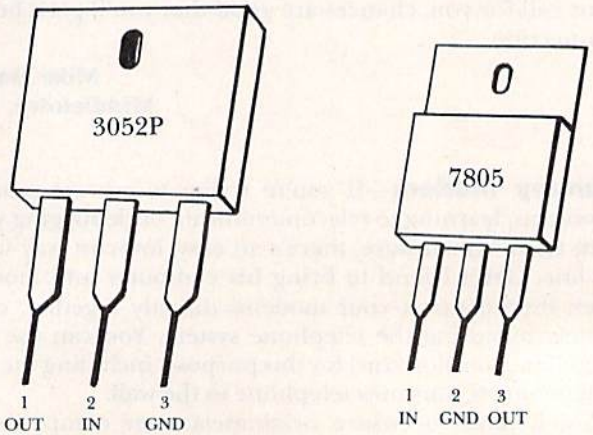
Power supply repairs—Commodore power supplies are subject to self-destruction, because of a weakness in the 3052P voltage regulator inside. Not only is it unreliable, but the 3052P isn't available in the United States. If your power supply fails, chances are that the problem is the 3052P. But you're in luck if your power supply is of the type that can be opened for servicing, because there's a widely available replacement regulator.

Many electronics dealers handle the ECG line of replacement ICs, and ECG makes an exact, pin-for-pin replacement for the 3052P. The part number is ECG-1934, and it costs about $7. If your ECG dealer doesn't stock the part, he should be glad to order it for you.

Bob Wingerter
Raceland, KY

Power supply repairs #2—If you can't locate an ECG-1934, you can try a lower-rated regulator, the more widely available ECG-7805. [Equivalent to the Radio Shack 276-1770. Ed.] It will be overloaded, but could work for you in a pinch.

The pin configurations of the two units are different, as illustrated below. I soldered a heavy wire onto pin 3 of the new regulator, then inserted the assembly into the 3052P socket, sliding the 7805 one hole to the right to line up the "in" and "gnd" pins with the original wiring. Then I soldered the 7805's new wire to the left hole of the 3052P socket.



Marty Irons
Goshen, NY

Dead Datassette—If your Datassette suddenly stops operating, but everything else works fine, the chances are good that part of your power supply has blown. The power supply provides both 5 volts dc and 9 volts ac, with the latter used for the tape deck. You can use a Radio Shack 273-1515 transformer, 18 volts center-tapped, to bypass a defective 9-volt supply. Unless you're qualified in electronics, you should get a knowledgeable friend to help you.

Strip the round power supply cord and identify the red and blue wires, plus two black ones. Cut the black wires and connect them to the 9-volt ac from your new transformer, and you should be back in business. If you want, you can attach the new transformer to the top of the old power supply; it's not too fancy, but it's definitely functional.

John Long
Clarkston, GA

16. Printer Paper and Ribbons

Easier paper loading—When loading fanfold paper into the printer, it's often difficult to force the flimsy sheets through the mechanism. I get around that by doubling the paper back on itself at the first fanfold crease, then feeding the double-thick piece into the printer.

Dan McCarthy
Glendale, CA

Easier paper loading #2—Here's another way. As the printer is running out of paper, be sure to leave the last sheet in the machine. Carefully align the leading edge of the new sheet with the trailing edge of the old one, and tape the two together. The old sheet will pull the new one into place.

David G. Ennis
Ridgecrest, CA

Using plain paper—If your printer doesn't have friction-feed capability, you can still use unperforated letterhead and other paper. If you're careful, you can tape the unperforated sheet to a perforated one, using the latter to carry the former through the machine.

A small piece of tape in each corner will hold the stationery in place, with perhaps another at the center top, to keep it from catching on the printer mechanism. The forms' thickness-control can be adjusted slightly if necessary.

Gwen Pelletier
North Eastham, MA

Thermal paper—If you're not happy with the way your thermal transfer printer works with standard computer paper, be aware that Hammermill makes fanfold paper (item #19900-0) specifically for thermal transfer technology. The paper contains micro perforations and is very smooth on one side. The results are excellent, and the price is comparable to standard computer paper.

Doug Mlodzinski
Canandaigua, NY

Single-sheet printing tips—Many printers have a paper alarm that discontinues printing when the paper runs out or breaks. The details of these alarm systems vary, but they work on the same general principles. On Commodore's 1526, for example, normal-feeding paper closes a microswitch placed inconspicuously in its path. When a paper outage opens the switch, the printer stops and the paper-advance button flashes as a warning.

The paper-alarm feature can be a nuisance when printing single sheets, especially when it activates partway down your printed page. Here are some ways to avoid this inconvenience.

- Tape a second sheet to the bottom of your page, avoiding the paper-out condition.
- If tape is too much trouble, wait until printing stops, then feed another sheet behind the first one. Just push it in until the printer mechanism stops it, and there's a good chance it will clear the alarm. Sometimes you must also press a switch to resume printing. On the 1526, you press the flashing paper-advance button.
- Use a DIP switch on the printer to deactivate the paper alarm. On the Gemini 10X, switch #1 on the back serves this purpose. If your printer has DIP switches, see if one of them does the same.

B. Franklin
Philadelphia, PA

Printing on envelopes—I use my printer for addressing envelopes, but sometimes the envelope slides around as it moves out of the range of the friction-feed device. I solve the problem by inserting a full-size sheet of paper under the envelope's flap, then feeding the envelope-paper combination into the printer.

Also, if your printer has a thickness lever, it's a good idea to set it to "thick" while printing on envelopes.

Alfred Lusher III
Cold Spring, KY

Making envelopes—In a pinch, you can make very serviceable envelopes from fanfold paper. Print the mailing address in the center of a fanfold sheet, then remove the sheet from the printer. Do not remove the perforated side strips. Fold the letter that is to go inside the envelope, then fold this sheet around it. Tape or glue the perforated sides and the flap, and there you have it.

Robert C. Lane
Danville, VA

Printing stencils—Dot-matrix printers strike hard enough to cut a mimeograph stencil. I've used Double-strike mode to get the best copies and have been well-pleased with the results of my word processor/computer printer combination.

Ed Schutz
Utica, MI

Making spirit masters—Spirit masters are used on the so-called "ditto" machines, found in countless schools, clubs and churches. Use your printer to make the master, and you've got a very low-cost, time-efficient duplicating system. You'll have to make a few trial runs to optimize reproduction quality, since the printer must strike the

paper with enough force to transfer the spirit ink onto the master.

Other printers may produce different results, but my Gemini 10X works best in Emphasize mode; Double-strike mode transfers too much ink, which results in filled-in letters. After printing, each of my masters makes about 75 copies. If I need more, I just print more masters!

Ed Schutz
Utica, MI

Two-up labels—If your labels are two-up (two across the page), but your program will only print one-up, never fear. Run through the whole box of labels using only the ones on the left side. Then flip the stack right over left and insert it in the printer. The labels that were on the right will now be on the left, where you can use them to your heart's content.

Linda R. Lang
Tucson, AZ

Pin-feed prestidigitation—To ease the repositioning of your pin-feed or tractor mechanisms, put an arrow-shaped piece of colored tape on each movable part, then put marks or other arrows where they can be lined up with the movable ones. Put these index marks at your chosen positions for standard paper, labels, narrow paper, and so on.

John W. Petty
Augsburg, West Germany

Paper saver—You can save paper by saving your old program listings. When you need to print something for your own use, use the reverse side of these discarded listings. This has worked well for me, especially with the higher-quality paper.

Mary Brigito
Old Forge, NY

Tractor-feed fodder—Some printers, like the 1525 and MPS-801, waste a sheet of paper every time they are set to top of form. Keep a clipboard handy, and, as you remove your printout from the printer, tear off that first blank sheet and add it to the clipboard. Clean, full-size sheets have plenty of uses around the house.

Phillip D. Deem
Indianapolis, IN

Visible perforations—My printer's smoke-gray cover makes it hard to see the paper perforations, and, consequently, I found it difficult to align the printhead and the top of the sheet. I solved the problem by running a dark, felt-tip marking pen over the points of all four corners of the folded paper. The ink soaks through the paper and makes it easy to see the perforations. Since they appear only on the outer edge of the paper, which is torn off and discarded, the ink marks have no effect on my final documents.

John B. Boninger
Rock Island, IL

Paper alarm—It's a good idea to ink a big cross on the third-to-last sheet of paper in the tray. This gives you a timely warning of imminent paper exhaustion.

Ian Haynes
Westville, South Africa

Ribbon replacements—If you don't have a source of inexpensive ribbons for your printer, take a worn-out ribbon to Radio Shack. Some of their ribbons are exact replacements for the Commodore 1525/MPS-801 and for other printers as well. If Radio Shack doesn't have what you need, try other local sources of ribbons. The key to success is letting them see your sample ribbon—many printers use identical ribbons, and most published cross-reference lists are incomplete.

Steven J. Guenther
Washington, DC

Ribbon re-inking—The 1525/MPS-801 and other printers have re-inkable cloth ribbons, and you can save money by re-inking them yourself. If your ribbon has a removable ink cartridge, the job isn't even very messy.

Be sure to use printer ribbon ink, since other inks may jam or abrade your print head. This ink is available from re-inker companies that advertise in *RUN*. Another possible source is the commercial ribbon re-inking companies that are found in most large cities. You may have to beg them to let you have some ink, but they're usually very understanding.

It's helpful to put a few drops of ink directly on the re-inking wick. The wick sometimes gets clogged with paper dust, in which case soaking it in solvent can help.

Bob Ingay
Victor, NY

Ribbon rejuvenation—A simple way to extend the life of your fabric ribbon is to spray it with a little WD-40 oil, available at any hardware store. The oil thins the ink and lets it flow into the print area. Use the WD-40 sparingly, and you'll probably have very good results. Don't forget to wash your hands.

Alan Helfers
Chatham, IL

17. Printers and Printing

Printer stands—Many common items can serve double-duty as printer stands, especially when you turn them upside down. Look through the housewares department in your local discount store, and you're certain to find something you can use.

Another source of printer stands is the office supply department. I use an inverted $2 stacking file, which fits my MPS-801 perfectly. It's the #982 from Sterling Plastics, and it's found in discount stores everywhere.

Frank Knorowski
Berwick, PA

Space saver—Unless you have a custom computer desk, it's always a problem finding room for your printer paper. I keep my paper in a cardboard tray made from the top of the carton it came in, but there's not much

room for it between my printer and the wall. Also, no matter where I put my paper, it tends to tear on the cables at the rear of the printer.

My solution is to prop the tray against the wall at a 45–75 degree angle. This lets me move the printer closer to the wall and out of my way on the desk. I put a large empty can or cardboard tube between the printer and the tray, and the paper never touches the cables.

Barry L. Cohen
New York, NY

1520 plotter supplies—Commodore's 1520 plotter has the same mechanism as Radio Shack's CGP-115 and uses the same supplies, which are available at any Radio Shack store. The paper is #26-1428. Black pens are #26-1480, and colored ones are #26-1481. As always, the price is right, and if your store doesn't stock these items, the manager can order them for you.

Richard Fader
Fort Lee, NJ

Plotter as printer—Commodore's slick little plotter can double as an 80-column word processing printer. Before loading your word processor, run the following driver program.

```
100 OPEN 6,6,6 : PRINT#6,1 : REM UPPER/LOWERCASE
200 OPEN 3,6,3 : PRINT#3,0 : REM 80 CHAR/LINE
300 OPEN 2,6,2 : PRINT#2,0 : REM BLACK INK
```

You must then set your word processor to send its text to device #6, rather than the usual 4 or 5. If you have PaperClip, run the MERGE PRTFIL-D program and merge PaperClip with the 1525-P-ALF printer file. Then run the PRINTER SETUP-D program and set the printer device to #6. Save this newly modified PaperClip program. When you run it, your printer device will automatically be set to 6.

We like to use the 1520 as a portable printer, and its small size more than makes up for its tiny little letters.

Thomas F. Trocco
New York, NY

1520 disk directories—The 1520 plotter's smallest character set can be very valuable in making disk directories. First, select a color with the color-change button. Then do this:

```
OPEN 3,6,3 : PRINT#3,"0" : CLOSE 3
LOAD"$",8
OPEN 4,6,0 : CMD4 : LIST
PRINT#4 : CLOSE 4
```

You will get a readable directory that is small enough to be taped to the disk jacket.

Robert Gruskiewicz
Wyoming, PA

Servicing the 1520 plotter—The Radio Shack CGP-115 printer-plotter is very similar to Commodore's own 1520. In fact, the paper transport, the pen transport and the electromechanical printing mechanism are identical on the two devices. Even though Radio Shack has discontinued the CGP-115, its operation and service manuals are still available, both under the same catalog number as the hardware, 26-1192. The operation manual doesn't relate to the Commodore plotter, but the service manual is very useful. It costs about $8, once you convince the store manager to order it from Texas.

By the way, don't forget that the pens and paper for the Radio Shack unit are directly compatible with the 1520.

Dave English
Orange, CA

1525/MPS-801 paper alignment—Here's how to ensure that this popular printer doesn't print a line on the perforations between sheets. Advance a sheet of paper until the tear line is exactly even with the top of the print head. Then advance the paper three double clicks. This sets the paper so that, regardless of the number of pages printed, all of the print lines will be on either side of the tear line.

No name
Address unknown

1525/MPS-801 paper-jam fix—I always had to watch my printer to make sure the paper exited properly, without jamming. Sometimes the perforated edge would get caught on the paper entering the printer from the rear. To fix the problem, I glued two pieces of stiff plastic to the plastic guide behind the carriage. They extend about two inches behind the printer and are completely effective.

John V. Gilmour III
Florence, SC

1525/MPS-801 carriage return—The carriage mechanism on these printers has a tendency to slow down as the printer ages. The solution is to clean and lightly oil the two metal bars that guide the print head down and back. If that is not sufficient, try boosting the carriage return spring by shortening it or by paralleling it with a rubber band.

James F. Ryan
Winthrop, MA

1525/MPS-801 underlining—You can underline with this printer by using a graphics line character on the line below the one you want to underline. Of course, no other characters can be printed in the same spaces as the graphic underlines, so when you underline, you should also double space. Here's the technique for underlining:

```
10 OPEN 4,4
20 PRINT#4,"UNDERLINING WITH THE MPS-801";CHR$(13);
   "{20 spaces}{7 CMDT}"
30 CLOSE 4
```

David Bushko
Address unknown

1525/MPS-801 and labels—Some models of this printer can take a minimum of 4½-inch paper. Before buying labels to use with it, carefully check their width, since many are only 4¼ inches wide and cannot be used with the MPS-801.

James Llanos
Ketchikan, AK

1526/MPS-802 secrets—The mechanism in this printer is the same as that in the Mannesmann Tally 185 Spirit-80; Spirit-80 ribbons work perfectly in the 1526. The lever at the right of the platen is to adjust for paper thickness. Normal position is toward the platen; if you are doing envelopes or three-part forms, or if your print is smudging, move it toward the front of the machine.

Quinze Vingtetsix
West Chester, PA

1526/MPS-802 underlining—There's a rumor going around that the 1526 won't underline. But CHR$(141) gives you a carriage return without a line feed, allowing you to overprint the line from the beginning. Try this for a demonstration:

```
10 OPEN 4,4
20 PRINT#4, "THIS IS A COMMODORE PRINTER"CHR$(141)"{10
   SPACES}{9 COMD @}"
30 CLOSE4
```

Marion Deland
New York, NY

1526/MPS-802 print sizes—Since printer manuals are hard for beginners to understand, many owners of Commodore's 1526 may not be aware that there are actually four sizes of print available. There is the regular size, plus three horizontally expanded fonts. The program below illustrates them very nicely.

```
2 A$ = CHR$(14)
4 OPEN4,4
6 PRINT#4,"THIS IS REGULAR PRINT"
8 PRINT#4,CHR$(13)
10 PRINT#4,A$;"THIS IS ENHANCED PRINT"
12 PRINT#4,CHR$(13)
14 PRINT#4,A$;A$;"GETTING BIGGER"
16 PRINT#4,CHR$(13)
18 PRINT#4,A$;A$;A$;"LARGEST!"
20 PRINT#4,CHR$(13)
22 CLOSE4
```

Some MPS-802s, and possibly some 1526s, will print a fourth enlargement, giving five sizes of print. You can test your own unit by repeating line 18 as line 21.

Gregory L. Bues
Milford, CT

1526/MPS-802 listings—This printer has a little-understood paging mode that allows it to skip over the perforations between sheets of paper. With very little effort, you can use this feature to get nice top and bottom margins on your multipage listings.

To try it out, put a long Basic program in memory—one that takes more than a page to list on the printer. Align the paper in your printer so the top of the sheet is just barely under the two black rollers on the movable paper bail, and enter the following line in Direct mode. The heading can be anything at all and, if you'd like, can be omitted.

```
OPEN4,4 : CMD4,"{SHIFT CLR}title" : LIST
```

Then watch as your printer makes a professional-quality listing. When the listing stops, don't advance the paper by hand. Instead, enter, in Direct mode:

```
PRINT#4,"{HOME}" : CLOSE4
```

You'll see the paper advance so the bottom perforation is right at the tear-off point on the silver bar that covers the platen.

You can add the following lines to any program, and a GOTO 10000 will get you a similar listing, but with a customized heading for the date or anything else you'd like. When the listing is finished, your cursor will be positioned so you can feed your sheet just by pressing the return key.

```
10000 REM ** LIST ON 1526 PRINTER - PERFS AT ROLLERS
10010 INPUT"HEADING";A$
10020 PRINT"{SHIFT CLR}{CRSR DN}PRINTCHR$(19) ; :
      PRINT#4:CLOSE4{2 CRSR UPs}":OPEN4,
      4:CMD4:PRINT"{SHIFT CLR}"A$:LIST
```

Remember, a question mark *cannot* be used in abbreviating the Print# statement.

Louis F. Sander
Pittsburgh, PA

PaperClip and the DPS-1101—Commodore's nice daisywheel printer can easily be used with the PaperClip word processor, *if* you know the secret. First, you *must* switch DIP switch #3 on the long bank of switches. Then use the 6400-A-NLF printer file. This will handle 5-pitch, 10-pitch, 12-pitch, 15-pitch, boldface, underline and sub/superscripts.

If you want to use shadow printing as well, you must run the printer setup program. When it asks you to load your previous file, load the 6400-A-NLF file. For "italics on," use codes 27, then 87. For "italics off," use 27, then 38. Please realize that you can't get italics with a daisywheel—you get shadow printing instead.

Thomas F. Trocco
New York, NY

Okimate programs—If you use your Okimate 10 to print pictures made with the popular Doodle! program, the manual says you need a Learn to Print disk plus your Doodle! file. Since Learn to Print has only 21 blocks free, the Doodle! file has to be on a separate disk, and you waste a lot of time in swapping disks.

I've learned that you don't need all the Learn to Print files. The ones you need leave over 500 blocks free on the disk, and you can use those blocks to store picture data and printer routines. These are the files you need: COLOR, N, W, S, U, V, T and AA. Use a file copy program to put them onto a disk, then fill the remaining space with your artwork.

Colin Crawford
Grafton, OH

Paper for the Okimate 10—This little printer will do wonderful black-on-white printing without a ribbon, *if* you use the right kind of thermal paper. The thermal paper for the IBM PC Junior is widely available and comes in rolls, fanfold and single sheets. It gives better print quality than you can get with a ribbon or with Okidata's special smooth paper.

William R. Alsing
St. Louis, MO

Paper for the Okimate 10 #2—When you are using a ribbon with this printer, regular computer paper gives very unsatisfactory copy. The special paper is expensive and sometimes hard to obtain. Believe it or not, inexpensive newsprint-like paper gives wonderful results! I buy cheap scribbling paper at my school supply store, and I save my stock of the special paper for important letters and reports.

Dale Leibensperger
Gang Mills, NY

Easy Script Oki-magic—If you have used the Okimate 10 with Easy Script, you may have been dismayed to find that the gaps for page-skipping are twice as wide as they should be and that the error increases with every printed page. The trouble is that both Okimate and Easy Script have an automatic page-skip feature. The solution is to disable the Okimate's automatic perf-skip by executing the following line before loading Easy Script.

```
OPEN 1,4,0 : PRINT#1,CHR$(27);"B"
```

Charles L. Baker
Topeka, KS

Olivetti PR2300 ink—Thousands of Commodore owners also own this printer, and most of them have run out of dry ink ampules. I searched for ampules for almost a year and finally gave up trying to find them. Out of desperation, I tried refilling my old ones with various types of pencil lead. After much testing, I've learned that Staedtler/Mars Duralar K3 gives excellent results. A single 5-inch piece is enough to refill an ampule ten times, at a cost of five cents per filling.

Jim R. Williamson
Carrollton, TX

Olivetti PR2300 ink #2—DAK Industries, the company that sold so many of these printers at closeout prices, still stocks the ampules. You can call them at 1-800-423-2866.

Gary Leonhardt
Roscoe, IL

Printer special features—Many non-Commodore printers have wonderful special features that can be used with commercial programs. To enable these features, one must often send several commands to the printer prior to loading the program. A good way to handle this without having to remember the commands is to include them in a small loader program that sends them, then loads the main program using dynamic keyboard techniques, as described in the "Programming Tips–General" section.

For example, I use the following program to set my Epson to Double-strike mode with a five-line skip over perforations, after which it loads the PractiCalc program.

```
10 Q$ = CHR$(34) : OPEN 4,4
20 PRINT#4,CHR$(27)"G"
30 PRINT#4,CHR$(27)"N"CHR$(5)
40 PRINT
50 PRINT"LOAD" Q$ "PRACTICALC" Q$ ",8,1{2 CRSR UPs}";
60 POKE 631,13 : POKE 198,1 : END
```

Donald D. Fick
Muscatine, IA

Printer cable hang-up—Some sophisticated programs, especially those involving the disk drive, seem to be sensitive to the presence of other peripheral devices. I found several fast-copy programs that hung up the computer whenever a printer cable was connected. Disabling the printer didn't help—I had to physically remove the printer cable from the serial bus. If you have a similar problem, try removing the printer cable first, then look to the other ports for possible remedies: cassette port, user port, cartridge slot and, perhaps, even the joystick ports.

Karl Thurber
Millbrook, AL

Printer lockup fix—If a program locks up while it is trying to communicate with the printer, don't panic. Turn the printer off, then back on, and you'll probably clear the lockup.

Michael P. Rogalski
Monrovia, CA

18. Video Displays and Loudspeakers

Eyesaver—It's not so obvious to everybody: Use your TV's contrast, brightness and other controls to optimize your programs's display. Often the best setting for text is quite different from the best setting for games and other programs.

Mark Emilio
Address unknown

Glaring nerdhood—Don't have a glare screen for your monitor? Just wear polarized sunglasses whenever you're computing. Your family may think you're withdrawing further into the tube, but you're really just saving money.

Mike Rogalski
Monrovia, CA

Soap opera computing—Watching a blank screen during long cassette loads becomes very boring. If you are using a TV as a monitor, you can solve this problem by flipping the TV/computer switch and watching some television. Switch back when the cassette drive stops, and your computer program will be waiting.

Steven J. Walsh
Seaford, NY

Tip for teachers—If your class is large, think about using a projection TV set for a monitor. Such equipment, though expensive, makes it a lot easier for the students to see the screen and react to what is on it.

Frank Piazza
Address unknown

Commodore and the VCR—If you have a VCR and a 1702 or similar monitor, you can watch TV on your computer screen. Using the front panel connections on the 1702, patch the VCR's audio-out to the monitor's audio-in. Then connect the VCR's video-out to the mon-

itor's video-in. Make sure the 1702's rear-panel slide switch is set for the front connections, then lean back and relax.

Reed Huish
Mesa, AZ

Screen layout aids—A 12-inch flexible steel ruler, of the type made by Bates and sold in office supply stores, makes a superb screen layout tool. Use the metric scale to measure CRT distances, and hi-res positioning will be easier than you've ever imagined.

To simplify the counting of text lines, draw a dot at the start of every fifth line on your screen, about 1 mm into the border. I use a Sharpie brand marker for permanence, and I make the dots as tiny as possible, to keep them from polluting the display.

Louis F. Sander
Pittsburgh, PA

Video audio—Many TVs have an annoying speaker buzz even when the sound is turned to its lowest setting. If you're using such a TV for a monitor, just plug a headphone into its headphone jack, and the buzz should disappear. Sometimes you can use just a plug, with nothing connected, and achieve the same effect.

Fred Lacey
Corvallis, OR

Monitor cables—If your 1702 cable has eight pins, but your computer's video jack has only five, then get out your needle-nose pliers. Use them to remove pins 6, 7 and 8 on the cable.

Reed Huish
Mesa, AZ

TV set switches—If you have a computer and a video game machine, you know how frustrating it is to constantly be connecting and reconnecting the switch boxes. My suggestion is to connect all the switch boxes to the TV set, leaving each external device connected to its own box. When you want to use a component, just switch its box to the computer position, leaving all the others in the TV position. When you want to change components, just turn the first one to TV and the second one to computer.

Michael Peterman
Lebanon, OR

Video monitor tips—My monitor is a green monochrome without a speaker, which is little help when a program involves color, sound, or both. But since the green monitor is plugged into the video connector on the back of my 64, the TV connector is vacant. I run a long cable from the TV connector to the switchbox on the back of my color TV. When a commercial comes on, I can do my color work without interrupting the family's viewing. The 64 can simultaneously drive both the monitor and the TV.

Of course, the cable connecting my green screen to the computer has a separate audio line. I patch it into my stereo receiver, so I can play the 64's sound. I frequently use this setup to record C-64 sound onto a cassette or reel-to-reel tape.

Stephen M. Zapytowski, Sr.
Beaverton, OR

Wavy video—If your power supply is physically close to your monitor, it can cause a slow, side-to-side waving in the video display. If you see such interference, try moving your power supply.

Sechzig Hertz
Storung, Germany

Computer/TV interference—If you use a slide switch on your TV antenna wire, it's possible that the video output from the computer can cause interference on other sets connected to the same antenna or cable. The problem is that the antenna lead coming into your switchbox is not terminated when the switch is in the computer position. Under that condition, the radio frequency from the computer can leak into the common antenna/cable system.

To solve this problem, install a TV-interference filter, as sold in most electronics stores. The proper place for it is at the connection between your antenna and switchbox. Putting it between the switchbox and TV won't help, because the interference arises inside the switchbox.

David J. Todeschini
Queens, NY

Ground your switchbox—Connecting the TV/computer switchbox to a good ground can dramatically reduce interference. In houses with three-wire electrical sockets, the screw on an outlet cover is usually very well-grounded.

Carl R. Wilcox
Dayton, OH

Toroid love story—Ferrite loops about two inches in diameter are very good interference traps. Wrap your computer-to-TV cable through one about three times, and you'll see what I mean.

John Cappuccilli
Fairview, NJ

Foiling interference—Try putting a cookie sheet or a large piece of aluminum foil under your computer. It can do wonders in reducing television interference.

Jim Barzydlo
Lincoln, NE

For high-quality monitors only—Some high-quality monochrome monitors have such good resolution that they show the individual dots that make up the characters. This can be visually annoying, and, if you have that trouble, there's a simple solution available. Connect a .0047 microfarad mylar capacitor between pins 1 and 4 of your video output cable. It dampens the sharp rise and fall of the video signal, smearing the dots and making them more continuous.

Jim Stephens
Nashville, TN

19. Entering Programs

Saving keystrokes—If you aren't interested in the contents of the REM statements in your program, don't eliminate the REM line entirely—just type the line number and the word REM. This saves keystrokes and avoids potential problems if the line is the destination of a Goto or Gosub statement.

Sue Harder
Chicago, IL

Audiovisual typing—Have a friend read the program line while you type it in or proofread it. If no suitable friend is available, use a tape recorder and read the lines to yourself.

Kathleen Mead
Westerville, OH

Typing in programs—To lessen the wear and tear on my precious copies of *RUN*, I use a copy machine to reproduce any programs I intend to type into the computer. As I type, I can mark, cut, spindle or mutilate the copy to my heart's content, with no chance of mutilating my magazine.

If the program doesn't run properly, it is much easier to compare a listing with the copy than to work with the whole magazine.

Geneva Hamilton
Fortuna, CA

Blow it up—If your copy machine has a setting that enlarges material, use that setting to copy your magazine listings. It makes them much easier to read as you type them in.

James Volk
Bellmore, NY

Musical stitchery typing tip—As an aid in typing programs, my husband and I have combined equipment from two other hobbies, music and cross-stitch. A music stand allows us to easily adjust the height of our material. To keep our place while typing, we use the metal sheet and magnetized strips that are sold as place holders for cross-stitch patterns. With the metal sheet behind the page we're working on, we slide the magnetized strip under the lines being typed. One word of warning: The magnetized strips can be disastrous to disks and tapes, so keep them away from your magnetic media.

Barbara Eberly
Cullowhee, NC

Magazine magnifier—I went to a store where needlepoint and embroidery notions are sold, and I bought a line magnifier, made for use with sewing instructions. It works quite nicely in magnifying the program lines as I type in goodies from *RUN*.

Mildred Carroll
Rosedale, NY

Placekeeping tip—Before starting to type a long program, I use a marker to highlight every other line. It gives a definite reference point to which I may return after looking away from the page.

Chris Markiewicz
Windsor, CT

Placekeeping tip #2—When typing in long programs, use a hi-liter marker to record your progress. These markers are available in transparent pastel colors in any stationery department. Every five lines or so, cross off the completed material with your marker. This is also a good method to use when checking for typing mistakes.

Ellen Pekar
Florence, MA

Placekeeping tip #3—Ever lose your place while typing a program from a magazine? Try cutting a piece of colored cellophane (approximately 9 inches long and 2 inches wide). Rub it on the page with the program, to build up static electricity, and it will stick to the page anywhere you slide it! Now use your magic cellophane to keep track of your place on the page. If it starts to slide off, just give it another rub.

Wake Lankard
Kenner, LA

Placekeeping tip #4—I use Scotch Post-It notes. These self-sticking sheets are easy to move around on the page, and they have many other uses around the computer room.

David Chang
Millbrae, CA

Placekeeping tip #5—I made a place marker by gluing a narrow strip of light cardboard to a clothes pin. The strip is long enough to go completely across the page, since most programs are printed in two columns.

Bro. Joseph M. Walsh
El Paso, TX

Typing Data statements—When typing a series of Data numbers, I place my fingers over the number keys, using them as the home row. Instead of inserting commas between the numbers, I use my thumb to enter spaces. Then, after entering the line, I go back to the beginning, this time proofreading my work and using the comma and cursor-right keys to put the commas where they belong.

I have found that I can enter data much faster this way, because of the modified touch system of typing and the accuracy that comes from the overall process.

K.W. McFall
Connersville, IN

Easydata—This C-64 program makes it easier to type Data statements by assigning new values to the back-arrow, @ and asterisk keys. After you run it, the back-arrow prints the shorthand abbreviation of Data, the @ key prints a comma and the asterisk executes a carriage return. These reassignments mean that your fingers never

leave the top row of keys when entering long listings of numerical Data statements. The run/stop/restore combination will restore the keys to their normal functions, while SYS900 will reactivate the Easydata feature.

As always with Magic's machine language programs, we have included a checksum routine to make sure you enter your data items correctly. The first time you run the program, you'll be informed if you made a typing error or that everything's all right. If all is well, delete lines 1–4, then save the program in the usual way.

```
1 FORY=1TO83:READZ:CS=CS+Z:NEXT
2 IFCS<>926ØTHENPRINT"DATA ERROR":STOP
3 PRINT"CHECKSUM OK. DELETE LINES 1-4,"
4 PRINT"THEN SAVE THE PROGRAM.":END
1Ø REM EASYDATA - MARK GRANZOW
11 DATA 12Ø,162,145,16Ø,ØØ3,142,Ø2Ø,ØØ3
12 DATA 14Ø,Ø21,ØØ3,Ø88,Ø96,Ø72,165,215
13 DATA 2Ø1,Ø95,2Ø8,Ø21,169,157,141,119
14 DATA ØØ2,169,Ø68,141,12Ø,ØØ2,169,Ø97
15 DATA 141,121,ØØ2,169,ØØ3,133,198,24Ø
16 DATA Ø38,2Ø1,Ø64,2Ø8,Ø16,169,157,141
17 DATA 119,ØØ2,169,Ø44,141,12Ø,ØØ2,169
18 DATA ØØ2,133,198,24Ø,Ø18,2Ø1,Ø42,2Ø8
19 DATA Ø14,169,Ø2Ø,141,119,ØØ2,169,Ø13
2Ø DATA 141,12Ø,ØØ2,169,ØØ2,133,198,1Ø4
21 DATA Ø76,191,234
3Ø M=PEEK(55)+256*PEEK(56):A$=CHR$(17)
4Ø PRINT"WORKING":FORJ=9ØØTO982:READK
5Ø IFK=191ANDM>32768THENPOKEJ,49:NEXT
6Ø POKEJ,K:NEXT:PRINTCHR$(147)
7Ø PRINT"SYS9ØØ REASSIGNS THESE KEYS:"
8Ø PRINTA$"{LEFT ARROW}=DATA @=COMMA *=RETU
   RN"
9Ø PRINTA$"STOP/RESTORE KILLS THEM."
1ØØ SYS9ØØ:NEW
```

Mark Granzow
Carol Stream, IL

Computer-assisted proofreading—When proofreading a program, it's helpful to scroll the screen up until the line to be read is at the very top of the screen. When looking back and forth from page to screen, this makes it much easier to locate the correct line. Once the line has been checked, use the cursor-down key to move the next line into position.

Rob Landeros
Olympia, WA

Proofreading tip—After you've typed in a program from a magazine, it's often necessary to proofread your work. This job can be made easier by listing your program onto the printer, then proofreading the printout against the original copy. Compared to reading the screen, reading the printout is easy on the eyes, and it's much easier to find errors. This method is also timesaving, since you don't have to keep listing to the screen.

Roberta Roberts
Chesapeake, VA

20. Languages—Basic

Keyword tokens—All the commands, keywords and functions that we use in Basic are converted to so-called tokens before being stored in memory. That is, the computer replaces each of these words with a single number between 128 and 202, then stores that number instead of the full word. The principle is the same on every Commodore machine. You can check this for yourself by entering this program:

```
100 PRINT :
110 PRINT "BYTES FREE =";FRE(0)+2116
```

(If you have something other than a C-64, delete the +2116.) Run the program to see how much free memory you have.

Then, after the colon in line 100, add another keyword of some sort (PRINT, RESTORE or REM will work fine). Run the program again and observe that your additional keyword used only one byte of memory. Welcome to the world of advanced computer science!

To see all the C-64's tokens and their associated keywords, run the following program. It prints the keywords directly from their locations in ROM memory.

```
1Ø REM C-64 TOKENS - DION HOUSTON
2Ø T=127:PRINT: FORI=41118TO41373:M=-(PEEK(
   I)-128>Ø):PRINTCHR$(PEEK(I)-M*128);
3Ø IFMTHENT=T+M:PRINTTAB(7);T
4Ø NEXT
```

Dion Houston
Bellevue, WA

CLR clarified—The manuals tell you that CLR gets rid of all variables, arrays and user-defined functions. It closes all files and clears the stack, which wipes out any Gosub statements and For. . . Next loops presently in effect. What the manual doesn't say is that a Restore is also called, setting the data pointer back to the beginning.

Brad Leypold
Colorado Springs, CO

Data statement bug—If you use shifted characters in a string in a Data statement, they will list improperly and disappear or give erratic results when read. The solution is to enclose the string in quotation marks.

David Martin
Little Rock, AR

DEF FN wizardry—Commodore Basic only allows one argument in user-defined functions, but this limit should not be taken seriously. I use functions with no arguments or with multiple arguments.

For example, when using the Read statement, it's useful to know from which line on the C-64 the data are being read. The line can be found by entering:

```
PEEK(63)+256*PEEK(64)
```

If I'm using that specific Peek a lot, I add the following line early in my program.

```
100 DEF FNP(X)=PEEK(63)+256*PEEK(64)
```

Then, whenever I want this information, I just type

```
PRINT FNP(X)
```

where X is a dummy argument.

If I want to read bit B from memory location M, I use DEF FN with multiple arguments as follows.

```
200 DEF FNR(B)=(PEEK(M) AND 2↑B)/(2↑B)
```

To use it to read bit 3 of memory location 32768, enter:

```
290 M=32768 : PRINT FNR(3)
```

Other examples are numerous. Just remember the key: Any complex, often-used arithmetic expression can be abbreviated in this fashion.

Dan Reisberg
Brooklyn, NY

Defining variables—It is sometimes desirable to define Basic variables in a certain order, particularly where execution speed is critical, and we want frequently used variables to be at the top of the heap.

To accomplish this, it is not necessary to assign a value to each variable, as most programs do. Commodore Basic allows you to establish variables in order, each with a value of 0, by using the DIM statement:

```
DIM X,Y,Z,A,P1,P2
```

Although the manuals make no reference to this use, the DIM command is not restricted just to array variables.

I. Adam
Vancouver, BC
Canada

For...Next statements—These initialize the loop variable before they compute the loop's end. You can use this to your benefit, especially if you're working in Direct mode. Take, for instance, the clearing of C-64 color memory, where it's common to remember the start as 1024 + 54272:

```
FOR I = 1024 + 54272 TO 1024 + 54272 + 1024 : POKE I,PEEK(646)
: NEXT
```

can be shortened to

```
FOR I = 1024 + 54272 TO I + 1024 : POKE I,PEEK(646) : NEXT
```

Curtis Sieber
Somerville, AL

Better For...Next delay loops—The following line is often used to wait until a key is pressed or a certain time has passed.

```
100 FOR T = 1 TO 2000 : GET A$ : IF A$ = "" THEN NEXT
110 Continuation of program
```

The above method usually works fine, but it includes a potentially fatal bug, since it can exit the For...Next loop without executing the Next. When such an exit is made, the computer's stack pointer is not restored to its proper value, and the chance of an Out of Memory error is greatly increased. It is better to use something like this:

```
100 FOR T = 1 TO 500 : T = T + (500 - T)*PEEK(198) : NEXT :
    POKE 198,0
110 Continuation of program
```

Location 198 contains the number of entries in the keyboard buffer. When no key is pressed, the loop sets T = T, then increments T; it finishes as soon as T = 500. As soon as a key is pressed, PEEK(198) = 1, setting T = 500. The loop is satisfied without corrupting the stack pointer.

If you begin line 100 with POKE 198,0 you will clear any previous keypresses before starting the delay loop. If you want to have the loop exit only when a certain key is pressed, you can do this:

```
100 FOR T = 1 TO 500 : T = T - (500 - T)*(PEEK(197) = X) : NEXT :
    POKE 198,0
110 Continuation of program
```

In this line, X would equal the value for the desired key as determined by the keyboard matrix table. You can find the value for the key you want by running this:

```
1 PRINT PEEK(197) : GOTO 1
```

When you press the key of interest, its matrix value will appear on the screen. This is the value you should substitute for X.

Katherine Myers
Fresno, CA

GET this straight!—Executing a Get statement will turn off any current CMD command in effect. This unsuspected effect can be the source of mysterious hexes in a program.

Mr. Smouse
Address unknown

Simple cursor for GET—The various methods of establishing a flashing cursor to use with the Get statement are sometimes unsatisfactory for reasons of complexity or their tendency to leave white squares on the screen. This easy way uses a non-blinking cursor and is perfectly fine for my purposes. Perhaps you will like it, too.

```
100 PRINT "{RVS ON}{SPACE}{RVS OFF}{CRSR LF}";
110 GET A$ : IF A$ = "" THEN 110
120 IF A$ = CHR$(13) THEN PRINT "{SPACE}"; CHR$(20) :
    GOTO 150
130 PRINT A$;
140 GOTO 100
150 Rest of program goes here
```

Osp Viggosdottir
Reykjavik, Iceland

GET# improved—Here's an incredible C-64 trick that works the same as the GET# statement, but is about five times faster. The editors tried it on a directory-reading program that contained a lot of GET# statements, and execution time was cut in half.

There's a routine in the operating system that works like CMD, but in the opposite direction—it defines a certain file as the input channel, rather than the output channel. To call the routine from Basic, Poke the filenumber into location 781, then execute a SYS 65478. Once that's done, you can use the normal GET statement to read a character from the file. When you're through reading from the file, you must clear the input channel with SYS 65484.

Those procedures are for the C-64, and may have to be modified for other machines. 65478 is the kernal CHKIN routine, while 65484 is the kernal's CLRCHN. The Poke to 781 causes the filenumber to be placed in the X-register before CHKIN is called.

The trick speeds things up because Basic is relieved from constantly switching its input channel between the keyboard and the file. Although we've only tested it on disk, it should work with cassette files, too.

Tim Gerchmez
Bellevue, WA

Calculated GOTO—This routine for the C-64 and VIC lets you go to a line number that is calculated within your program. To use it, just set variable GL equal to the line number to be executed, then enter GOTO 63000. The

routine can be put in any three consecutive lines, provided the third line is typed exactly as shown here, with no spaces between any of the characters.

```
63000 GL$=STR$(GL) : LN=LEN(GL$) -
      1 : GL$=RIGHT$("0000" + RIGHT$(GL$,LN),5)
63010 FOR DI=1TO5 : BY(DI)=ASC(MID$(GL$,DI,1)) : NEXT DI
63030 AD=PEEK(62)*256+PEEK(61):FORDI=
      1TO5:POKEAD+51+DI,BY(DI):NEXT:GOTO00000
```

The routine works by Poking memory to change the last characters of the third line. You can test the routine by setting GL, then executing it, then listing it. In the listing, the 00000 should be replaced by the value of GL.

Douglas Johnson
Evesham, England

If...Then...Else—Unfortunately, Commodore Basic doesn't have this useful construction, which allows you to redirect the program if the If statement fails. You can use the ON...GOTO statement to give a similar effect, as in this example:

```
400 GET A$ : IF A$="" THEN 400
500 ON((A$="Y")+2) GOTO 600 : ON ((A$="N")+2) GOTO 700 :
    GOTO 400
600 PRINT "YES" : END
700 PRINT "NO" : END
```

Note how the two tests have been put on the same program line.

Mike Sokolewicz
San Francisco, CA

No-question-mark Input—Here's an easy way to get it:

```
10 POKE 631,154 : POKE 198,1 : INPUT"PROMPT {CTRL 7}";IN$
```

The {CTRL 7} changes the print color to dark blue, so the question mark, though printed, is invisible. The two Pokes put a light-blue character into the keyboard buffer, so your response to the prompt will be visible. If you aren't using these screen and print colors, change the {CTRL 7} and the CHR$(154) to the appropriate values, found in your user's manual.

The Pokes given here are for the C-64 and VIC. To use this technique with other machines, substitute the proper values in place of 631 and 198. You can find them in the Dynamic Keyboard trick in the "Programming Tips–General" section.

Steve Freedkin
East Lansing, MI

Input with default—Input parameters are often known in advance, but sometimes you may want to make a change. If the Input statement itself contains the most-used parameter, you can select it just by pressing the return key. If another parameter is desired, you merely type it in the usual way. Here's a simple example:

```
INPUT "DEVICE NUMBER{2 spaces}8{3 CRSR LFs}";D
```

The number 8 will appear under the cursor and can be selected by hitting the return key.

E. Dam Ravn
Olstykke, Denmark

Easy Input filter—Many real-world problems only make sense if the input data is made up of non-negative integers. For example, when inputting the number of items in an inventory, you must make sure there are no negative numbers or fractions.

Of course, the programmer's sacred duty in these cases is to trap erroneous input responses before they can cause problems. Here's an elegant input filter that excludes both fractions and negative numbers. Notice how simple it is and how it does its job without resorting to Boolean operators.

```
10 INPUT "HOW MANY RABBITS IN THE HAT";N
20 IF INT(ABS(N))<>N THEN 10
30 Rest of program goes here.
```

Thomas Henry
N. Mankato, MN

Improving on INT—The Basic function INT(X) is very useful, but sometimes you want the integer closest to X. (INT works by a kind of truncation, not by rounding off.) The simplest way to get the rounded value is by the formula INT(X + 0.5).

This works for both positive and negative numbers, but a problem still remains, since

INT(+3.5+0.5)=4 and INT(−3.5+0.5)=−3

You can cure this by defining and using a function such as

```
DEF FNI(X) = SGN(X)*INT(SGN(X)*X+0.5)
```

Jerry Bridgman
Madison, WI

Loading overlays—When the Load command is used in Program mode, the loaded program must be shorter than the one that loads it. As soon as it loads, the second program is automatically executed, and any variables set by the first program retain their values.

For string variables, however, things are not so simple. Their values will be lost unless the first program has concatenated them to something. If A$ = "TEXT", just use A$ = "TEXT" + "", and the necessary condition will have been met.

Reinhard Ruscher
Szekesfehervar, Hungary

Load in Program mode—It is well-known that if you load one program from another, the variables from the first program remain intact and are immediately accessible to the second one. It's also well-known that the second program must be shorter than the first, or the computer will become confused.

It's not so well-known that similar problems arise when the second program, after being loaded from the first, is saved to disk or tape. What happens is that the Save routine thinks the second program is now as long as the first, so it saves much more than is required. At the time, this is usually unnoticed by the operator, but it can cause future problems and erratic operation.

So, if you need to make changes to your second program, you must execute a New statement, then load it from Direct mode. Make your changes, then resave it.

H.K. Hirashima
Billerica, MA

Loading machine language—The common way to load a machine language program from disk is:

```
LOAD "filename",8,1
```

It isn't widely known that *any* odd number can be used instead of the 1. I find it easier to use:

```
LOAD "filename",8,9
```

since the 9 is right next to the 8 on the keyboard.

Eric the Juggler
Squirrel Hill, PA

MID$ documentation error—The book erroneously says that MID$'s numeric parameters can range from 0–255. But if either one has a value of 0, an error immediately occurs. Forewarned is forearmed.

J. Paul Keller
Springfield, VA

Open command glitch—Any time the Open command is used with device number 2, all variables and arrays are cleared. Device number 2 is reserved for RS-232 devices, and activating it makes some internal changes to prepare for RS-232. Whether or not you have an RS-232 device connected, OPENx,2,y will clear all your variables. Therefore, be very careful about using device number 2 at any time. If you're writing a program involving an RS-232 device, be sure to open your channel before setting any critical variables.

Heather Albright
Ventura, CA

Printing quotes—If you want to print quotation marks, you'll soon discover that you can't put them inside a Print statement. The solution is to Print CHR$(34).

Andrew Apold
Panama Canal Zone

Printing quotes #2—When you print a quotation mark, your machine goes into Quote mode, which may be contrary to your wishes. You can avoid the problem by using:

```
PRINT CHR$(34) CHR$(20) CHR$(34)
```

THE CHR$(20) is a Delete, which wipes out your first quote. The second quote then overwrites it and takes the machine out of Quote mode.

Bruce Romney
Suffern, NY

Printing the bottom line—You've probably had the maddening experience of printing something on the bottom line of the screen, only to see everything scroll up a line. To prevent this, press the cursor-up key twice as the last characters of the line.

William W. Braun
Arnold, MO

Shifted REMs—If you put a shifted letter inside a REM statement, the computer will interpret it as a Basic keyword when it is listed. (The same is true of the graphics characters created by the Commodore key.)

A shifted L in any REM statement will cause a Syntax error if the computer tries to list it. REM followed by an alternating series of shifted Vs and unshifted spaces will commemorate nylon stockings, the Olympics and an equally famous fountain of knowledge. Replacing the shifted Vs with shifted Ss will show what you do with the latter.

When shifted or Commodore key characters follow a quotation mark, they list as themselves rather than as Basic keywords. So, if you *must* use shifted characters in your REM statements, precede them by a quotation mark.

Ellen Pekar
Florence, MA

Uses for REMs—REM statements are much more helpful than just describing a subroutine or giving credit to the program originator. I use them at the beginning of each program to list the source and location of the program, plus any special instructions that may be required in using it. It saves me from having to dig through stacks of magazines trying to find the article. For example:

```
10 REM FILE HANDLER—RUN FEB 84 PAGE 48
20 REM USE SPACE BAR TO SKIM PAGES. USE RETURN TO SKIM
   CATALOG.
```

Howard VanDover
Trenton, MI

C-64 selective Restore—Do you ever need to restore the data pointer to a specific line in your program? (Plus/4 and C-128 owners are lucky—their Restore command will accept a line number as an argument.)

On the C-64, you can use this strange-looking program to have the same effect. Just set variable RL to the number of the desired line, then enter GOSUB 1000.

```
1000 POKE 785,232:POKE 786,7:POKE 209,232:POKE 210,7:POKE
     211,0:POKE 213,39
1010 PRINT "{SPACE}S{CTRL 9}&${CTRL 0}{COMD *}{CTRL 9}
     HD{CTRL 0}{SHIFT A}{CTRL 9}${CTRL 0}
     {SHIFT SPACE}{CTRL 9}D{CTRL 0}{SHIFT B}
     {SHIFT SPACE}":POKE RL,PEEK(RL):RL = USR(RL):RETURN
```

I've said it before, and I'll say it again. It may not look like it, but it works!

Randy Thompson
Eugene, OR

Random numbers—The general formula for producing a random number between A and B is:

```
N = RND(0)*(B – A) + A
```

If you wanted to choose Ns between 30 and 40, for example, you would use:

```
N = RND(0)*(40 – 30) + 30
```

You could combine the numbers inside the parentheses, of course, and if you wanted only integers as N, you could use the INT function to get it or use N% rather than N. To correct for the downward rounding in these cases, the quantity inside parentheses must be changed to (1 + B – A).

Mary D. Brigito
Old Forge, NY

STOP and CONT—These two commands can be used as valuable debugging tools. CONT will restart a program that has been halted by the stop key, or by an End or Stop statement. Execution will continue from the statement following whatever caused the halt.

You can put STOP into your program at various test points. When the program encounters a Stop command, the number of the last line executed will be shown on the screen, proving that the program reached the line in question. While the program is halted, you can check the value of variables, and can even change them if you'd like. A Direct mode CONT will, of course, resume program execution.

Charles Brogdon
Dalton, GA

Tab magic—The number used in a Tab statement can be as large as 255; this can be very helpful when formatting a screen. PRINT TAB(240) is much easier than five Print statements, yet both give the same result.

Randy Thompson
Eugene, OR

Verifying machine language—The Verify command works with machine language as well as Basic. A program saved and loaded with the ,8,1 suffix can be verified using:

```
VERIFY "filename",8,1
```

Charles Lavin
Coral Gables, FL

WAIT for keypresses—A good way to pause until a key has been pressed is this:

```
100 WAIT 198,1 : GETA$ : REM C-64 AND VIC
100 WAIT 239,1 : GETA$ : REM PLUS/4 AND C-16
100 WAIT 208,1 : GETA$ : REM C-128
```

It's simpler than a loop using GET and can be put into a line with other statements.

Unknown contributor
Unknown address

WAIT for special keys—You can use the Wait statement to pause until the shift, Commodore or Control keys are pressed. The command is of the form:

```
WAIT FL,N
```

where FL depends on your machine as

```
653 for the C-64 and VIC
1347 for the Plus/4 and C-16
211 for the C-128
```

and N depends on the key you're waiting for

```
1 for the shift key
2 for the Commodore key
4 for the control (CTRL) key
```

Kenneth H. Hottes
Danbury, CT

21. Languages—Machine Language

Machine language definitions—The following may help you understand the mysteries of machine language.

Source code—word commands like LDA and JMP. Easy to program in and easy for knowledgeable humans to understand. For the microprocessor to understand it as machine language, it must be translated by an assembler.

Source listing—a printout of a program's source code, usually including comments that make it easier for humans to follow.

Object code—fully numeric commands, usually expressed in hexadecimal format, which the microprocessor directly understands. Hard for humans to program in and to understand.

Assembler—A program that accepts written word commands (source code) and converts them to fully numeric form (object code).

Disassembler—A program that translates object code (numeric) back into source code (word commands). Such source code lacks the comments that make the original source listing so valuable.

Monitor—a program that lets you directly examine the contents of specified memory areas. Usually allows you to alter these contents as well. Many monitors also include simple assemblers and disassemblers.

Mary Brigito
Old Forge, NY

Machine language lesson—Many readers are totally in the dark when it comes to machine language. It may shed a little light if we explain the various sections of an assembly listing.

This machine language program creates an unusual color display on the C-64's screen. We have provided a Basic program to Poke it into memory, beginning at 828 decimal ($033C hex). Type it in, run it and observe some psychedelic magic.

```
1 FORX = 0TO9:READA:POKE828 + X,A:NEXT:DATA120,206,33,
  208,206,33,208,76,61,3:SYS828
```

You can regain control of your machine by simultaneously pressing the run/stop and restore keys. Here's an assembly listing of the program, along with an explanation.

```
033C  78        SEI
033D  CE  21 D0 DEC  $D021
0340  CE  21 D0 DEC  $D021
0343  4C  3D 03 JMP  $033D
```

- Each line in the listing describes a single machine language instruction.
- The first column indicates the memory location, in hexadecimal format, of the first byte in the instruction.
- The next three columns show, in hex, the byte or bytes that make up the instruction. A complete instruction can be one, two or three bytes in length.
- The final columns show the mnemonic representation of the instruction.

In the first line of the sample program, you can see that memory location $033C holds a $78, and that the $78 is the hex form of a SEI instruction. (SEI sets the interrupt mask. You don't have to know any machine language to see the value of the mnemonic.)

Louis F. Sander
Pittsburgh, PA

Machine language memory locations—For programmers, Basic automatically allocates memory as needed, so you never have to concern yourself with memory matters. Machine language, however, requires you to choose every memory location used by your program. Locations from 0–255 are particularly useful, since machine language's zero-page instructions can access them

in miraculous ways. They are also particularly scarce, since the computer and its operating system make heavy use of them. In the C-64, the following zero-page locations are available for user programs.

182 and 247–254—Available if the RS-232 channel is not being used.

251–254—Always available for user programs.

If you are not using the Datassette recorder, several other zero-page locations may be safely available. For clues as to where they are, consult the memory map in your *Commodore 64 Programmer's Reference Guide.*

Many other locations in C-64 memory are also available for machine language programs, and they may or may not be interfered with by Basic or the Datassette. Following are some commonly used ones.

679–767—Unused by C-64

820–827—Unused by C-64

828–1019—Cassette buffer. Used if you use the Datassette. Otherwise, untouched.

1020–1023—Unused by C-64. (Notice that locations on either side of the cassette buffer are available for machine language use.)

2048–40959—Basic program space. This area is used by Basic programs. If you know how to adjust the Basic pointers in locations 43–56, you can protect parts of this area from alteration by Basic's activities.

49152–53247—Unused by C-64. This is the largest and most commonly used area in which to load machine language programs.

On other computers, similar locations will be available for your use. To find them, study your memory map.

Many contributors
All across the land

Machine language in tape buffer—On the C-64, it's easy to keep any machine language routine in the cassette buffer, even while loading or saving; just type POKE 179,4 before your tape activity. The computer will then use screen memory for its tape activities, leaving your machine language intact in 828–1019. If you don't like the resulting screen disruption, choose another location and Poke it into 178 and 179.

Michael L. Smith
Pacific, MO

Magic ML poker—Machine language programs are usually (and conveniently) listed as hexadecimal memory dumps, with an address and eight hex bytes on each line. In many cases, we convert those bytes to decimal form, then type them into Data statements, where a Basic program can read them and Poke them into memory. Unfortunately, this process often introduces errors, and since the Data statements bear little resemblance to the original ML listing, the errors can be *very* hard to find.

The accompanying C-64 program avoids these troubles, letting the original hex dump be used verbatim in the Data statements. It eliminates the use of commas and allows proofreading of Data statements against the original ML dump. Lines 100–170 are the program itself; the others are a test routine that Pokes some letters onto a C-64 screen.

To use the main program on your own ML, just delete the extra lines, then do this:

- In line 110, set variable BA to the decimal value of the ML's beginning address.
- Add your Data statements, each consisting of a line number, the word DATA and the data item as described below.
- Each Data item must consist of a four-hex-digit address, followed by any number of hex bytes (usually eight or fewer), all separated by single spaces. There must be no punctuation marks or other characters on the line. (Most hex listings are very close to this form already.)
- Add a final Data statement, of fewer than six characters, to mark the end of your ML. The number 999 works fine.
- Run the program. As it reads each Data statement, it ignores the four-character address, then checks that each other item is a valid hex byte. (If you type an I for a one, the poker will catch it, showing you the defective entry and the number of the line it's in. Hallelujah!) Finally, it converts the bytes to decimal and Pokes them into the proper locations.

```
10 REM{2 SPACEs}MAGIC ML POKER
20 POKE53281,1:PRINT"{SHFT CLR}":POKE53281,
   6
30 :
100 REM{2 SPACEs}MAGIC ML POKER
105 REM{2 SPACEs}CREATED BY LOUIS F. SANDER
110 BA=1024:READHD$:HD$=MID$(HD$,6):IFHD$="
    "THEN170
120 FORP=1TOLEN(HD$)STEP3:BY$=MID$(HD$,P,2)
130 HN=ASC(BY$)-48:HN=HN+7*(HN>9):IFHN<0ORH
    N>15THEN160
140 LN=ASC(RIGHT$(BY$,1))-48:LN=LN+7*(LN>9)
    :IFLN<0ORLN>15THEN160
150 POKEBA+Q,LN+16*HN:Q=Q+1:NEXT:GOTO110
160 PRINT"ERROR IN"PEEK(63)+256*PEEK(64)":
    "BY$:END
170 PRINT"DONE!":END
1000 :
1001 DATA 0400 01 02 03 04 05 06 07 08
1002 DATA 0408 09 0A 0B 0C
1003 DATA 999
```

Louis F. Sander
Pittsburgh, PA

Machine language saves—This short sequence will save a machine language program to disk without upsetting any Basic pointers. SA is the starting address of the material to be saved, and EA is its ending address + 1.

```
POKE 175,EA/256
POKE 174,EA - 256*PEEK(175)
POKE 194,SA
POKE 193,SA - 256*PEEK(194)
OPEN 15,8,15,"filename"
SYS 62957
CLOSE 15
```

Wallace Fini
San Diego, CA

Loading the registers—On the C-64 and VIC-20, memory locations 780–783 are used to save and reload registers between SYS calls. Values placed in these locations are placed in the corresponding registers before the SYS is executed. When the program returns to Basic, the then-current register values will be put in these locations.

You may examine them from Basic to determine the results of the called routine. The locations and their contents are:

780—accumulator
781—X register
782—Y register
783—status register

G.R. Davies
Los Altos, CA

Waiting for shift—You can use this routine to pause your program if the C-64's shift key is depressed. (It also works with the CTRL and Commodore keys.) The shift-lock key will hold the pause indefinitely.

```
C100 LDA $028D
C103 BNE $C100
```

Roy B. Graff
Sheridan, WY

22. Languages—Other

Comal sprites—Comal is a great language that makes programming sprites especially easy. The only problem is that since the VIC-II chip can only "see" 16K at a time, the Comal sprite commands put the sprites on the graphics screen. As it turns out, however, we only need to replace two of the commands to put sprites on the text screen. Try substituting these two procedures for the Comal commands Define and Identify. (Notice that FUNC BITOR is called by IDENTIFY"TX PROC. Comal 2.0 has BITOR built-in.)

```
PROC DEFINE"TX(IMAGE#,DEFINITION$) CLOSED
  FOR I:=0 TO 63 DO
    POKE I+IMAGE#*64,ORD(DEFINITION$(I+1))
  ENDFOR I
ENDPROC DEFINE"TX

PROC IDENTIFY"TX(SPRITE#,IMAGE#) CLOSED
  POKE SPRITE#+2040,IMAGE#
  POKE 53269,BITOR(PEEK(53269),2↑SPRITE#)
ENDPROC IDENTIFY"TX

FUNC BITOR(NUM,MASK) CLOSED
  POKE 2024,169      // LDA# NUM
  POKE 2025,NUM      //
  POKE 2026,9        // ORA# MASK
  POKE 2027,MASK     //
  POKE 2028,141      // STA 2032
  POKE 2029,240      //
  POKE 2030,7        //
  POKE 2031,96       // RTS
  SYS 2024
  RETURN PEEK(2032)
ENDFUNC BITOR
```

The syntax is the same: The sprite number, image number and definition string are used the same way. The only difference is that *only* image numbers 13, 14, 15 and 189 are safe to use, and SETGRAPHIC is not needed!

A. Hanson Kappelman
Pittsburgh, PA

Logo tips—When using the Logo language on the C-64, you can use the run/stop key to get out of the Editor. Outside the Editor, you can repeat a line continuously by pressing the up-arrow key. If you find that your lines or colors overlap, simply use the Doublecolor mode rather than the Singlecolor mode. And finally, in words and lists Logo, you can get multiple blank spaces by putting them inside apostrophes.

Valerie Ann Brown
Brownsburg, Quebec
Canada

Logo program—This will print a decorated tree. Type CTREE 40 for the best result or CTREE 10 to check your typing.

```
TO CTREE :L
  TREE :L
  TEE
END
TO TEE
  PC 9
  RT 180 FD 40 RT 90 FD 20 BK 40
END
TO TREE
  HT FULLSCREEN
  BG 0
  PC 1+RANDOM 15
  IF :L<5 STOP
  RT 45
  FD :L
  TREE :L*0.75
  BK :L
  LT 90
  FD :L
  TREE :L*0.75
  BK : L
  RT 45
  TREE :L/2
END
```

D.A. Barrows
Centerville, MA

Logo tool—In Commodore Logo, typing GOODBYE will erase all your work from memory. To ensure that you've saved it to external storage, add this procedure:

```
TO GB
PR [HAVE YOU SAVED YOUR WORK?]
MAKE "ANSWER REQUEST
IF :ANSWER=[Y] THEN GOODBYE
END
```

Now, instead of typing GOODBYE, always type GB. If you answer the prompt with anything other than Y, you'll have a second chance to save your work.

Alan L. Brown
Islington, Ontario
Canada

Logo autostart—To make your Logo program run automatically after you've read it in, add this to the program before you save it:

```
MAKE "STARTUP {starting procedure}
```

In place of the words "starting procedure," substitute the name of the procedure you want to start with.

Alan L. Brown
Islington, Ontario
Canada

23. Programming Tips—Debugging

Tips for beginners—I've learned that most novice programmers have similar problems in figuring out what to do when an error message presents itself. I always give them the following checklist, which should expose the majority of problems:

1. Read the error message and make sure you understand it. If necessary, consult your user's guide.
2. List the line mentioned in the error message and read it over for obvious errors. You should be able to spot most Syntax errors if you read carefully, remembering that Basic often chokes on anything that looks like a keyword.
3. Print out the value of each variable on the offending line and write down its value. This will help you find errors like a bad array index or a bad argument to a string function.
4. If possible, execute in succession each separate Basic statement on the line. You might be able to tell which statement killed the program.
5. If these steps fail or expose a problem that you don't know how to fix, then you probably don't understand how your program works. In this case, you should read over it, tracing out how it executes until you understand the problem.
6. As a last resort, seek help. This is last because you need to learn how to solve your own problems if you ever really want to know what you're doing.

Andrew M. Fregly
Greenbelt, MD

Error finder—If you're having trouble debugging a program, wait until just before the error is executed, then press the stop key. You should get a Break error in a certain line number, which usually gives you a good idea of the location of your bug.

Steve Myers
Monroe, MI

Test it—To test small parts of a program without disturbing anything already in memory, give your program fragment a high line number and run with that number. For example, if you're not certain whether the square root function is called by SQR or SQRT, do this:

```
50000 PRINT SQRT (25) {RETURN}
      RUN 50000 {RETURN}
```

R.P. Mayor
Swampscott, MA

Follow the cursor—When debugging a program, list the lines of interest, then use your cursor to follow the line while you read or review the program. It works great when someone else reads to you, and you can both celebrate when the offending bug is killed. It works even better if you change cursor color.

R. Ferdman
Riviera, AZ

Use Stop—To help in debugging, I list the offending line and insert Stop commands between two of the line's statements. Then whenever the program stops, I get a Break error. If the break happens before the bug asserts itself, I know the error is somewhere after the Stop. If the bug comes up first, I know the opposite. I can continue the program after it has stopped by executing CONT in Direct mode.

Paul L. Biggs
Ogalalla, NE

Crowder probe—This debugging tool is named after its inventor, my friend Kevin Crowder. It has saved us days of debugging time, at very little cost. To use it, insert this subroutine at the end of your program:

```
30000 POKE 53280,PROBE : FOR J = 1 TO 1000 : NEXT :
      PROBE = PROBE + 1 : RETURN
```

Each time it is called, it changes the border color and pauses briefly so you can see where you are.

Now put Gosub statements to access the Probe subroutine at important points in your program. When the program executes them, the border color will change.

Jim Von Ehr
Plano, TX

Data debugging—Sometimes when using a checksum program to assist in the correct entry of Data statements, you continue to get checksum errors even though the data items seem to be correct. In those cases, you probably have a punctuation error in your Data statements, such as a period instead of a comma, or an extra comma that adds a spurious zero to your data.

Marie E. Coon
Bothell, WA

Check the checksum—Much can be learned by examining the value of the checksum number. If it has a decimal point in it, there's an unwanted period in your Data statements.

Also, by comparing its value with the known "good" value, you can learn something about the size of the discrepancy in your program. If it's off by a lot, you're reading too few or too many Data statements. If it's off by just a little, maybe you've mistyped a number. If it's off by 34, you know to look for some sort of error that involves that number.

Larry W. Self
Shelby, NC

Debugging tip—Debugging a routine that follows several Input statements can be the ultimate in tedium, since you must make all the inputs each time you run the program. Avoid this useless repetition by temporarily changing the Input statements to Read statements, and providing data for them to read. For example, instead of

```
100 INPUT A,B,C
110 Rest of program
```

you can temporarily use

```
100 REM INPUT A,B,C
102 READ A,B,C : DATA 12,34,56
110 Rest of program
```

This will quickly get you into the more troublesome parts of your program.

Peter L. Rasco, Jr.
Address unknown

Examining arrays—Every now and then you have to find a bug in a large array. You could wear out your fingers doing it one element at a time. Yet, if you write a routine to examine the elements, typing the line numbers will destroy them. The solution? The following Direct mode command lets you look at a new element every time you press a key. Use a repeating key to zip through them quickly.

```
FOR J=0 TO 9999 : PRINT J,A$(J) : WAIT 198,1 : POKE 198,0 :
NEXT
```

If your array is something other than A$( ), of course, you'll use the proper name in this line. Each screen line will contain a subscript number and the contents of that element in the array. As soon as you exceed the size of the array, a Bad Subscript error will get you out of your loop.

Alan P. Davenport
Salem, OR

Debugging hint—When debugging a program with a lot of variables, I find it helpful to "echo print" the variables. This is done by putting a Print statement in the program each time a variable is defined or updated. For example, to echo print the variable A, I enter:

```
160 A=INT(RND(0)*10) : PRINT A
```

When debugging a program like this, it's easy to find where a variable is going astray, since each value is printed as the program is run.

James Ryan
Winthrop, MA

Line tack—When you're debugging a program and get a Syntax error in a line that appears correct, try listing the line by itself. (Example: LIST 120.) If you get two lines instead of one, you have what I call *line tack*. It's caused when you type a line exactly 40 characters long, then type another line below it, without first pressing the return key.

The computer interprets this as one long line and executes it correctly until it encounters the second line number, which causes the error. The cure is to type both lines again, being careful to press the return key at the end of the first one. If you're skillful with the screen editor, you can list the offending line twice, then edit both listings to achieve the desired effect.

Rickey Bartlett
Plumerville, AR

Line feed fix—Commodore computers are subject to an occasional but maddening malady, where the cursor refuses to line feed when the return key is pressed. It will jump to the end of the current line, but will refuse to go any further. The problem usually arises when hard-copy printing is aborted by the stop key or some other non-standard means.

Pressing the shift key along with the return key will move the cursor to the start of the next screen line. Then, typing a letter or two and pressing the return key will cause a Syntax error, which will end the line feed problem.

At this point, there is probably some garbage in your printer's buffer. Give it something unimportant to print, and the buffer will clear itself.

Beldare Lecone
Remulac, France

Tough to see—When using PRINT TAB(x), you may get a Bad Subscript error. For example:

```
100 PRINTAB (25);"HEMIPTERA"
RUN
? BAD SUBSCRIPT ERROR IN 100
```

Since there are no subscripts in line 100, you might think something has gone haywire. But the real reason is that a "T" was left out, making the computer print the value of AB(25)! This error is hard to find, because you'd normally expect a Syntax error. Of course, if the number in parentheses is less than 11, you won't get any error message at all. Instead, you'll get a 0 on the screen.

Charles Brogdon
Dalton, GA

24. Programming Tips—General

Automatic line numbering—This Direct mode line puts ten line numbers on the screen. By moving your cursor to the proper position on the screen line, then typing a program line, you can use them as line numbers.

```
FOR A=10 TO 100 STEP 10 : PRINT A : NEXT
```

The number values, of course, can be changed to anything you'd like. If you're typing in Data statements, change the line to read:

```
FOR A=10 TO 100 STEP 10 : PRINT A;"DATA" : NEXT
```

You then only have to enter the data items themselves.

Lum Kin Leon
Kuala Lumpur, Malaysia

Program subsets—If you want to extract a few lines from a program (for example, a sound or scoring subroutine), there's an easier way than by deleting all the unwanted lines. The method is to load the program, list the desired lines on the screen, then enter NEW. Move your cursor onto each of the lines you want to save, and press the return key. This will put the lines into memory as a new program, which can easily be saved. The method can be used to save lines that are not contiguous, as well.

If you want to extract more lines than can be listed on the screen at one time, just go through the procedure more than once, saving each segment with a different name. Then merge all the segments together, using the following procedure.

- Load and List segment #1.
- Load segment #2.
- Put your cursor on each of the listed lines from segment #1, pressing the return key on each line.
- Save the combined segments, and repeat as necessary.

Ian Hayes
Westville, South Africa

Programming trick—While programming, if you are not sure whether a line must be deleted, just insert a REM statement at the beginning of that line. This way, the line

will not be executed if you run your program, and you'll be able to know if you have to keep it in. If you do have to retain the original line, just delete the REM statement and press the return key.

Alain Niquet
Alma, Quebec
Canada

Easy GO testing—When testing a program that uses On...Go commands, or perhaps computed Goto's, it's useful to establish dummy lines as the targets for those commands, so you can get easy proof that the program is going where you want it to. Once you have that proof, you can replace the dummies with more interesting sections of code.

The ideal dummy line would be easy to type in, easy to replicate with various line numbers and would be self-documenting when executed. After years of looking, I finally found it:

```
1200 STOP:RETURN
```

When executed, this line will cause a Break in XXX message, where XXX is whatever line number you've given it. When you then enter CONT, the program will return from the subroutine. Of course, if you've used a Goto rather than a Gosub command, you don't need the Return command in your dummy line.

Louis F. Sander
Pittsburgh, PA

Programming tip—When developing a program, you can save time by making the last step a List rather than an End. Then when the program is run, you can see the results and easily make any needed changes. When the program is right, just change List to End, then save it.

John P. Oprea
Kirkland, WA

Dynamic keyboard explained—It's easy to make a program simulate keypresses, with truly magical effect. The technique has been around at least since 1978 and is commonly called *dynamic keyboard*. The basic idea is to have your program Poke the CHR$ values of one or more characters into the *keyboard buffer* area of memory. When the program is finished, the computer will print the Ready prompt, then act like you've *typed* the Poked characters.

The keyboard buffer occupies the ten memory locations from 631–640 decimal. It works in conjunction with location 198, which must always hold a count of the characters Poked into the buffer. For the Plus/4 and C-16, the buffer runs from 1319–1328, and the counter is in 239. For the C-128, these locations are 842–851 and 208. Run this little program to see the principle in action:

```
10 FOR I=1 TO 10 : POKE 630+I,65 : NEXT : POKE 198,10 : END
```

The Plus/4 version is:

```
10 FORI=1TO10:POKE 1398+I,65:NEXT:POKE 239,10:END
```

The C-128 version is:

```
10 FOR I=1 TO 10:POKE841+I,65:NEXT:POKE208,10:END
```

You should get the Ready prompt, followed by a series of ten A's (CHR$(65) is A). Change the 65 to 64+I, and you'll get the first ten characters of the alphabet. Change the 10s to smaller numbers, and you'll get fewer letters.

Dynamic keyboard's *real* magic comes when your program prints an executable statement on the screen, then makes the Ready prompt appear on the line above it. If the buffer holds a 13, it's just like putting the cursor on that statement and hitting the return key; your computer will do whatever the statement tells it to.

Clever programmers can print up to *ten* Direct mode lines, with proper spacing between them, then put CHR$(13)s into the buffer, causing all those lines to be executed. The key to success is careful placement of the screen commands and careful positioning of the cursor at the moment the program ends.

R.E. Peat
Pittsburgh, PA

Programmable Run key—CHR$(131) is equivalent to the shifted run/stop key. That is, it automatically loads and runs a program. Unfortunately, you cannot print CHR$(131) and expect this result, but you can Poke it into the keyboard buffer as follows:

```
10 POKE 631,131 : POKE 198,1 : END : REM C-64 and VIC
10 POKE 1319,131 : POKE 239,1 : END : REM PLUS 4 and C-16
10 POKE 842,131 : POKE 208,1 : END : REM C-128
```

When the line is executed, it will print the combination described above. If you're reasonably skilled at positioning on the screen, you can combine this and the previous trick to make a programmable load and run. Unlike a load executed from Program mode, this has no restrictions on program size.

Mark DuRussel
Midland, MI

Using illegal direct keywords—C-64 and VIC memory locations 57 and 58 hold the line number of the Basic statement currently being executed. When no numbered statement is being executed, location 58 contains a 255.

In Direct mode, if the start of your line Pokes 58 with anything less than 255, you can use a Basic keyword in the rest of your line. Some keywords are otherwise illegal in Direct mode: Input, Input#, Get, Get# and DEF FN.

One practical use for this is determining the result of a defined formula before placing it in the program. Another is reading the disk error channel with Input#.

Richard Shackelton
Chatham, NY

Why disable run/stop?—There are several ways to disable the run/stop key, but few explanations of why you would want to do it. One such circumstance arises when writing files to disk. Any interruption at that time could result in data being lost or the file being improperly closed.

Devaun Ferguson
Aniwa, WI

Timekeeper—For an easy way to keep track of time while programming, try this: As soon as you turn on your computer, type the following in Direct mode:

```
TI$="hhmmss"
```

where hhmmss is the correct time in hours, minutes and seconds. Then, whenever you want to know the time, just type PRINT TI$, and your built-in clock will tell you. You should note that the clock isn't extremely accurate and

will be slowed down by tape operations, but it's good enough for most purposes.

Darren Atwater
Delta, British Columbia
Canada

Time format—The TI$ variable is somewhat confusing, since it includes hours, minutes and seconds with no separators. Since TI$ is a string variable, the string manipulation commands can be used to add a colon and drop off the seconds.

```
100 PRINT LEFT$(TI$,2) ":" MID$(TI$,3,2)
```

Mark Doble
Mons, Belgium

Program delays—To halt your program until a key is pressed, try this:

```
10 PRINT "PRESS ANY KEY TO CONTINUE"
20 POKE 198,0 : WAIT 198,1:POKE 198,0
30 Program continues here
```

On the C-16 and Plus/4, use 239 instead of 198. On the C-128, use 208.

Andres Rios
Montevideo, Uruguay

Named subroutines—They are easy. Just do this:

```
100 GOSUB 1000,SUBROUTINE NAME : Rest of line goes here
```

It works because, when Basic returns from the subroutine, it looks for the next colon or line number, ignoring the subroutine name. It's useful because it lets you put a remark inside a program line, while eliminating the need for the REM statement.

Richard Murray
Red Deer, Alberta
Canada

Deek—Commodore machines store addresses in a low-byte, high-byte format, which means that to convert the address to decimal form, you must enter a statement similar to

```
20 SV = PEEK(45) + 256 * PEEK(46)
```

to get the value of the low byte plus the high byte multiplied by 256.

If your program does many such conversions, it may be convenient to set up a user-defined function to do them. Often the function is named DEEK (a mnemonic for Double pEEK). Here it is:

```
10 DEF FN DEEK(A) = PEEK(A) + 256 * PEEK(A + 1)
```

When you want to find a two-byte address whose low byte is at NN, you enter

```
20 SV = FN DEEK (NN)
```

Notice that the dummy variable name used in the DEF FN statement need not be used when you call the function itself.

William Keith Prusaczyk
Athens, GA

Lost variables—Ever wonder why you lost all your variables without typing CLR or RUN? They all go into never-never land when you type in a new line or make any changes to an existing one. Even deleting a non-existent line will wipe out all your variables.

On the C-128, this situation has been changed. You can do anything at all with your program lines, and your variables stay just as they were. Only CLR and RUN can change them. It's a wonderful aid in debugging.

Robert Spandau
Palm Desert, CA

Protected variables—Did you ever need a variable whose value is unchanged by CLR or other variable-destroying activities? A good technique is to Poke the number into an unused memory location, then Peek it later when you need it. If your number is greater than 255, you'll have to use more than one location.

I also use this technique when I need a new variable and can't remember what names have already been used.

Mike Maynard
Bossier City, LA

Redimensioning arrays—Here's a technique you can use to free up memory space and redimension arrays without getting a fatal Redim'd Array error. On all machines but the C-128, it resets the array pointer, clearing the array space without clearing other variables. To use it, simply insert the following line before the computer encounters another DIM statement.

```
POKE 49,PEEK(47) : POKE 50,PEEK(48)
```

The C-128 version is:

```
BANK5 : POKE51, PEEK(49) : POKE52, PEEK(50) : BANK 15
```

Jim Knarr
N. Manchester, IN

Detecting peripherals—When a program is running, you can determine whether a specific device is on-line by executing the following, where DN is the device number in question.

```
40 OPEN15,DN,15:CLOSE15
50 DI$ = "OK":IFST < > 0THENDI$ = "OFF LINE"
60 PRINTDN ;DI$
```

The key is to access the peripheral through channel 15, then read the status variable ST. If it has a non-zero value, the peripheral is off-line.

Fred Roberts
Charlotte, NC

Terminating games—Many computer games end with the player's man, android or spaceship being blasted or otherwise put to death. Unlike the real-world variety, this death is generally reversible, often by pressing a key. Vigorous pursuers of realism will appreciate the routine below, which is a *real* android killer. Executing the appropriate version blacks out the screen, disables all keys and sounds, and thoroughly corrupts any Basic program in memory. There is *no* way to recover. The first routine is for the C-64, the second is for the VIC-20. For the 128, it's simple—just GO64!

```
6400 REM ** KILLER FOR C-64 **
6410 POKE808,225:POKE53280,0:POKE53265,11:POKE649,0
6420 FORX = 54272TO54296:POKEX,0:NEXT
```

→

Listing continued.

```
6430 FORX=2048TOPEEK(61)+256*PEEK(62)
     STEP7:POKEX,PEEK(56324) :NEXT:WAITX,0
20000 REM ** KILLER FOR VIC-20 **
20010 PRINTCHR$(147):POKE808,127:POKE36879,8:POKE649,0
20020 FORX=36874TO36878:POKEX,0:NEXT
20030 FORX=4096TOPEEK(61)+256*PEEK(62)STEP7:
      POKEX,PEEK(162):NEXT:WAITX,0
```

Louis F. Sander
Pittsburgh, PA

25. Programming Tips—Mathematical

Normal distribution—The bell-shaped normal distribution curve is a useful tool in statistics and quality control. If ME is the mean of the distribution, and SD is the standard deviation, this line will produce Xs that are randomly distributed.

```
100 X=ME+SD*((-2*LOG(RND(0)){UP ARROW}.5*COS(2*{PI}
    *RND(0)))
```

Put the line in a For. . .Next loop, and it will generate as many numbers as you'd like. INT(X) could be used to generate integers, if that's your pleasure.

Frank Biondi
Pittsburgh, PA

Speedy execution—There are two ways of putting polynomial calculations into a Basic program. One closely duplicates the normal algebraic notation, while the other uses parentheses and looks somewhat unusual. The unusual-looking method is illustrated below, along with proof that it is much more rapidly executed than the standard method.

```
10 A=2 : B=3 : C=4 : D=5 : X=2.5 : T=TI
20 FOR I=1 TO 100
30 Y=A*X + B*X12 + C*X13 + D*X14
40 NEXT
50 PRINT "TIME=";TI-T;"ANSWER=";Y
60 T=TI : FOR I=1 TO 100
70 Y=(((D*X+C)*X+B)*X+A)*X
80 NEXT
90 PRINT "TIME=";TI-T;"ANSWER=";Y
```

Dennis P. Dykstra
Vienna, Austria

Toggling—If you need to toggle between two values in a program, set the toggle variable to one of the values, then use:

```
TG=[sum of the two values]-TG
```

For instance, if the two values were 3 and 7, you'd execute TG = 10 – TG each time you needed to toggle the value.

There's also a quick way of toggling between three or more values, as long as there's a regular relationship between them. Without going into the details, the formula for values of 1, 2 and 3 is:

```
TG=TG+1+(TG=3)*3
```

With a little effort, the formula can be adapted to work with any regular sequence of values.

Clay Carr
Westerville, OH

To float or not to float—Does a floating-point variable or integer variable use less memory? Each side has its advocates, but the real answer asks another question first—how is the number used? As a single variable, such as a simple counter, using I is shorter than I% by the one byte needed to type the %. Otherwise, they use exactly the same amount of memory. However, if you use an integer array, then I%(J) will use much less memory than storing the same numbers in array I(J) because the computer stores integer arrays more compactly.

Marilyn Sallee
Alliance, NE

Random numbers, all different—This routine generates a series of random numbers, of which no two are the same. It is perfect for programs involving decks of cards or for lottery-type programs where the restrictions do not allow for duplication. The number of elements to be selected from is A; to choose numbers ranging from 1 to 40, set A = 40. The number of selections to make is B; to draw six numbers, set B = 6.

```
20 N=1 : DIM P(A)
25 X=INT(RND(0)*A+1) : IF N>1 THEN 200
30 P(N)=X : PRINT P(N) : N=N+1
35 IF N=B+1 THEN END
200 FOR M=1 TO N : IF X=P(M) THEN 25
210 NEXT M : GOTO 30
```

Gene Majewski
Schiller Park, IL

Decimal flags—Here's an easy way to put six flags in one integer variable. It uses the first six prime numbers (2, 3, 5, 7, 11 and 13) as flags for six conditions. Multiply together the prime numbers corresponding to each "ON" condition, and put the result in an integer variable. For example, if conditions 3, 4 and 6 are ON, the number is 5 × 7 × 13 = 455. Set X% = 455, and you can use statements like

```
101 IF X%/2 = INT(X%/2) THEN PRINT "CONDITION 1 IS ON"
102 IF X%/3 = INT(X%/3) THEN PRINT "CONDITION 2 IS ON"
103 IF X%/5 = INT(X%/5) THEN PRINT "CONDITION 3 IS ON"
104 Etc.
```

to determine which conditions are ON. This works because X% is evenly divisible by each of the prime numbers that were multiplied together to get X% in the first place, but is not evenly divisible by any other prime. The technique fails if X% = 0.

David Hall
Saskatoon, Saskatchewan
Canada

Binary flags—Often when reading about programming, you see references to setting or clearing a certain bit (turning it on or off). Doing this is not difficult at all, once you know the magic. If the eight bits in a byte are numbered from 0 (low-order bit) through 7 (high-order bit), you can clear a single bit in memory location X by entering:

```
POKE X,PEEK(X) AND (255-2↑bitnumber)
```

You can set a bit in location X by entering:

```
POKE X,PEEK(X) OR (2↑bitnumber)
```

Robert Rovinsky
Duluth, MN

26. Programming Tips—Screen Display

Improved reverse characters—After typing CTRL 9, type in some words and look closely at them. The uppercase characters are not completely surrounded by reverse video, so they look cut off at the top. They will take on a more professional look if you put a row of unreversed COMD@ characters, CHR$(164), just above the reverse characters needing the improvement.

Perfectly Clear
Honolulu, HI

Quote mode tip—When a quotation mark is printed to the screen, the value of memory location 212 (C-64 and VIC) is changed from its normal 0, and the computer goes into Quote mode. In Quote mode, of course, cursor controls and other control characters print as reverse-field graphics symbols. If you print the quote mark from within a program, but want to avoid going into Quote mode, just enter POKE 212,0 after printing the quotation mark.

For the C-128, execute POKE 244,0. For the Plus/4 and C-16, the proper version is POKE 203,0.

Joseph R. Charnetski
Dallas, PA

Tricky screen formatting—If you use horizontal lines to divide your screen, this routine will let you print them in most unusual ways. Use GOSUB 1210 to print a line that starts in the center and moves simultaneously toward both ends. Use GOSUB 1220 to print a line from both ends converging toward the center. You can shorten the lines by adding to X in line 1220 or Y in line 1210. Each number added will shorten the line by two spaces.

```
1200 REM**JOSEPH R. CHARNETSKI**
1210 X=19 : Y=1 : Z=-1 : GOTO 1230 : REM FROM CENTER
1220 X=1 : Y=19 : Z=1 : REM FROM BOTH ENDS
1230 FOR J=X TO Y STEP Z : PRINT TAB(J)"{SHIFT C}";
1240 PRINT TAB(39-J)"{SHIFT C}{CRSR UP}"
1250 NEXT : PRINT : RETURN
```

Joseph R. Charnetski
Dallas, PA

Centered printing—You can center A$ on the screen as follows.

```
100 DEF FNC(X)=20-(LEN(A$)/2)
110 More program lines, if desired
120 Etc.
700 A$="PRESTIDIGITATION" : PRINT TAB(FNC(X));A$
710 A$="IS" : PRINT TAB(FNC(X));A$
720 A$="PLEASURABLE!" : PRINT TAB(FNC(X));A$
```

The X is a dummy argument, not used, but required to avoid a Syntax error. For the VIC, use 11 rather than 20 in line 100.

Carol A. Sowle
Fort Wayne, IN

Vertical tabbing—You can easily have a vertical tab function, similar to Commodore's horizontal TAB, by using:

```
100 DIM VTAB$(25) : A$="{HOME}" : VTAB$(0)=A$
110 FOR J=1 TO 25 : A$=A$+"{CRSR DN}" :
    VTAB$(J)=A$ : NEXT
```

Then, if you enter PRINT VTAB$(n), the cursor will move to the start of screen line n, in the same way that PRINT TAB(n) moves it to column n. As usual, the first line and column are numbered 0, rather than 1.

Louis F. Sander
Pittsburgh, PA

PRINT# to the screen—By using variables for device number and secondary address in your Open statement, you can easily send your output to the printer or to the screen. You need only change the values of the variables. Printer device numbers are usually 4 or 5, with various secondary addresses. The screen uses device number 3 and secondary address 1. (The C-64 *User's Guide* mistakenly shows it as device number 0.) Here is an example for the MPS-801 printer in Upper/Lowercase mode:

```
100 INPUT "WANT PRINTED COPY (Y/N)";A$
110 DV=4 : SA=7 : IF A$="N" THEN DV=3 : SA=1
120 OPEN 1,DV,SA
130 PRINT#1,"THIS IS THE OUTPUT"
140 CLOSE 1
```

C.G. Sperling
Greenville, SC

Screen layout aid—When I design a hi-res screen, I take an overhead projector transparency pen and draw on my video monitor a picture of how I want the screen to look. Then I take my graphics program and plot dots underneath my pen lines. If I make a mistake or want to change something, I simply take a wet tissue and wipe off the lines on the screen. If you adopt this method of layout, be sure you use transparency pens, not permanent markers. A popular transparency pen made by Vis-a-Vis can be found in most bookstores.

Scott Eldridge
Lima, OH

Graphics memory map—Here's a listing of all the memory locations used with the VIC-II chip. In the style of many memory maps, the lower memory locations are lower on the page. The Label column contains the names often given to these locations in Commodore literature. For ease in finding the locations that control the sprites, we've printed them in all capital letters. To gain an in-depth understanding of the function of each memory location, consult the *Commodore 64 Programmer's Reference Guide* or any good book on Commodore graphics.

Hex	Offset	Dec	Label	Function
$D02E	V+46	53294	SP7COL	SPRITE 7 COLOR
$D02D	V+45	53293	SP6COL	SPRITE 6 COLOR
$D02C	V+44	53292	SP5COL	SPRITE 5 COLOR
$D02B	V+43	53291	SP4COL	SPRITE 4 COLOR
$D02A	V+42	53290	SP3COL	SPRITE 3 COLOR
$D029	V+41	53289	SP2COL	SPRITE 2 COLOR
$D028	V+40	53288	SP1COL	SPRITE 1 COLOR
$D027	V+39	53287	SP0COL	SPRITE 0 COLOR
$D026	V+38	53286	SPMC1	2ND MULTI-COLOR SPRITE COLOR
$D025	V+37	53285	SPMC0	1ST MULTI-COLOR SPRITE COLOR
$D024	V+36	53284	BGCOL3	Background Color 3
$D023	V+35	53283	BGCOL2	Background Color 2
$D022	V+34	53282	BGCOL1	Background Color 1

$D021	V+33	53281	BGCOL0	Background Color 0
$D020	V+32	53280	EXTCOL	Border Color
$D01F	V+31	53279	SPBGCL	BITS FOR SPRITE-BACKGROUND COLLISION DETECT
$D01E	V+30	53278	SPSPCL	BITS FOR SPRITE-SPRITE COLLISION DETECT
$D01D	V+29	53277	XXPAND	BITS FOR SPRITE HORIZONTAL EXPANSION
$D01C	V+28	53276	SPMC	BITS FOR SPRITE MULTICOLOR ENABLE
$D01B	V+27	53275	SPBGPR	BITS FOR SPRITE-BACKGROUND PRIORITY
$D01A	V+26	53274	IRQMSK	Interrupt Mask Register
$D019	V+25	53273	VICIRQ	Interrupt Status Register
$D018	V+24	53272	VMCSB	Memory Control Register
$D017	V+23	53271	YXPAND	BITS FOR SPRITE VERTICAL EXPANSION
$D016	V+22	53270	SCROLX	Control Register
$D015	V+21	53269	SPENA	BITS FOR SPRITE DISPLAY ENABLE
$D014	V+20	53268	LPENY	Light Pen Y Position
$D013	V+19	53267	LPENX	Light Pen X Position
$D012	V+18	53266	RASTER	Raster Register
$D011	V+17	53265	SCROLY	Control Register
$D010	V+16	53264	MSIGX	BITS FOR SPRITE X POSITION MOST SIGNIFICANT BIT
$D00F	V+15	53263	SP7Y	SPRITE 7 Y POSITION
$D00E	V+14	53262	SP7X	SPRITE 7 X POSITION
$D00D	V+13	53261	SP6Y	SPRITE 6 Y POSITION
$D00C	V+12	53260	SP6X	SPRITE 6 X POSITION
$D00B	V+11	53259	SP5Y	SPRITE 5 Y POSITION
$D00A	V+10	53258	SP5X	SPRITE 5 X POSITION
$D009	V+9	53257	SP4Y	SPRITE 4 Y POSITION
$D008	V+8	53256	SP4X	SPRITE 4 X POSITION
$D007	V+7	53255	SP3Y	SPRITE 3 Y POSITION
$D006	V+6	53254	SP3X	SPRITE 3 X POSITION
$D005	V+5	53253	SP2Y	SPRITE 2 Y POSITION
$D004	V+4	53252	SP2X	SPRITE 2 X POSITION
$D003	V+3	53251	SP1Y	SPRITE 1 Y POSITION
$D002	V+2	53250	SP1X	SPRITE 1 X POSITION
$D001	V+1	53249	SP0Y	SPRITE 0 Y POSITION
$D000	V	53248	SP0X	SPRITE 0 X POSITION

Louis F. Sander
Pittsburgh, PA

Sprite troubles—When checking for sprite collisions on some machines, you find a colliding sprite that suddenly disappears. These are called sparkles, and the best way to avoid them is to check each location twice. If you detect a collision on the first check but not on the second, your collision was really a sparkle.

Steven Davis
Address unknown

Magic flasher—This subroutine can make all or part of your screen prompt flash on and off. It adds a little class and pizazz, with very little effort.

```
500 REM ** MAGIC FLASHER **
510 PRINT "PRESS RETURN {CTRL RVS OFF} TO
    CONTINUE"
520 PRINT "{2 CRSR UPs}" : IF PEEK(162)AND32 THEN PRINT
    "{CTRL RVS}";
530 GET A$ : IF A$="" THEN 510
540 PRINT "{CTRL RVS OFF}" : RETURN
```

A Gosub 500 will put the prompt on the screen, with the first two words flashing. The rate of flash is set by Peeking a bit in the real-time clock. For a faster rate, replace the 32 in line 520 with a 1, 2, 4, 8 or 16. For a slower rate, use 64 or 128. Moving the RVS OFF character in line 510 will change the amount of the prompt that flashes. Once any key is pressed, the subroutine returns with A$ equal to the character that was entered.

Frank C. Gutowski
Cheswick, PA

Fade in, fade out—Have you ever thought of having the title of your program fade in, then out, on a black screen? It's a nice effect, and it's actually quite simple. Commodore machines have 16 colors, three of which are different shades of gray, with black and white at either end, and you can use them in your fading process. The following program summarizes it. Have fun!

```
10 POKE 53280,0 : POKE 53281,0
20 A$(1)="{CTRL 2}" : A$(2)="{COMD 8}" : A$(3)="{COMD 5}" :
   A$(4)="{COMD 4}" : A$(5)="{CTRL 1}"
30 INPUT "{SHIFT CLR} MESSAGE";ME$
40 PRINT "{SHIFT CLR}" : FOR J=5 TO 1 STEP -1 : PRINT
   "{HOME}";A$(J);ME$ : FOR K=1 TO 95 : NEXT : NEXT
50 FOR J=1 TO 5 : PRINT "{HOME}";A$(J);ME$ : FOR K=1 TO 95
   : NEXT : NEXT : PRINT A$(1)
```

Line 10 sets the C-64 and C-128 screen and border colors to black. If you have a different machine, replace that line with one of your own.

Greg Burns
Address unknown

Answer screen—You can use the following line to acknowledge correct responses in educational programs. (To squeeze it into one line, you must abbreviate every Basic keyword.) It flashes the word "RIGHT!" in the center of a blank screen.

```
500 PRINT"{SHFT CLR}":FORX=1TO12:PRINTTAB(17)
    "{10 CRSR DNs}RIGHT!":FORY=1TO80:NEXT:PRINT
    "{SHFT CLR}":FORZ=1TO80:NEXT:NEXT
```

It would be easy to use the line in a subroutine or to change the word it prints.

Marlene Dunn
Miami, FL

Customized Ready prompt—We have changed the C-64 operating system, so that instead of the Ready prompt, a customized message will appear. To do this, lines 10–20 transfer the basic operating system to RAM. Line 30 causes the Ready prompt to be looked for at memory location 828 rather than its usual place. Lines 40–60 put the new prompt into locations 828 on up.

```
10 FOR J=40960 TO 49151 : POKEJ,PEEK(J) : NEXT
20 POKE 1,PEEK(1)AND254
30 POKE 42101,60 : POKE 42103,3
40 FOR J=0 TO 33 : READ K : POKE J+828,K : NEXT
50 DATA 013,010,087,072,065,084,032,083
60 DATA 072,079,085,076,068,032,073,032
70 DATA 068,079,032,078,079,087,044,032
80 DATA 077,065,083,084,069,082,063,013
90 DATA 010,000
```

If you put this routine at the beginning of some of your programs, you can have a lot of fun. Line 10 takes some time to do its work, but the results are worth it.

Those who know about CHR$ codes can construct their own message by changing the Data statements shown here. The first two and the last three must always be as shown, but you can put any reasonable number of char-

acters in between. The possibilities are limitless, and a lot of action can be had from very little work.

Brian Axford
Petawawa, Ontario
Canada

Customized and optimized—You can modify the above program to let you pick your own prompt message. Just delete lines 40–90, then replace them with these:

```
40 INPUT "PROMPT TEXT";P$
50 POKE 828,13 : POKE 829,10
60 FOR J = 1 TO LEN(P$) : POKE 829 + J,ASC(MID$(P$,J,1)) : NEXT
70 POKE J,13 : POKE J + 1,10 : POKE J + 2,0
```

Since the Pokes in line 10 take quite a while to complete, you might want to use machine language to speed them up. Check out the ROMwriter trick in this issue's C-64 section.

K.M. Bridwell
Address unknown

27. Programming Tips—Sound

Froggy—This is one of those accidents that makes a realistic sound effect that couldn't be predicted. Give it a try, and remember that frogs eat bugs.

```
1Ø REM FROGGY - JAMES A. LISOWSKI
11Ø D=16:A=54272:POKEA+24,15:POKEA+6,Ø:POKE
    A+1,1ØØ:POKEA+5,2
12Ø IF(PEEK(162)ANDD)=DTHENPOKEA+4,33
13Ø POKEA+4,Ø:GOTO12Ø
```

James A. Lisowski
S. Milwaukee, WI

Drum sounds—The SID chip's noise waveform can be used for more than gunshots. By varying the pitch, filter and ADSR, you can create some useful percussion sounds. This program gives you a sample of some of them. The first group can be used as drum sounds, while the next 50 simulate cymbals. As numbers are Poked into the coarse-frequency register, they are also displayed on the screen.

Once you've chosen a sound, you can fine-tune it by adding the filter and varying the filter type, cutoff frequency and resonance. For a basic rock beat, set up two click sounds followed by a cymbal crash with twice each click's duration.

```
1Ø REM DRUM SOUNDS - TOM JEFFRIES
11Ø S=54272:FORL=STOS+24:POKEL,Ø:NEXT:POKES
    +24,15:POKES+5,17:REM SET SID
12Ø FORF=ØTO5Ø:POKES+1,F:PRINTF:POKES+4,129
    :FORT=1TO3Ø:NEXT:POKES+4,128
13Ø FORT=1TO3ØØ:NEXT:NEXT:IFA=ØTHENA=1:POKE
    S+5,37:POKES+6,136:GOTO12Ø
```

Tom Jeffries
Oakland, CA

Easier ADSR—To get good ADSR settings, you don't need to go to the manual and spend all afternoon adding numbers until you get a sound you like. Instead of that, you can do this (for voice #1):

```
100 POKE 54277,16*A + D : POKE 54278,16*S + R
```

where A = attack, D = decay, S = sustain and R = release. The values must be between 0 and 15.

Sergio Daniel Freue
Buenos Aires, Argentina

Instrument Pokes—In the chart below are some settings to simulate musical instruments.

Instrument	Waveform	Attack/ Decay	Sustain/ Release	Pulse Rate
Flute	17	96	0	N/A
Trumpet	33	96	0	N/A
Piano	65	9	0	Lo 255, Hi 0
Harpsichord	33	9	0	N/A
Accordion	17	102	0	N/A
Organ	17	0	240	N/A
Xylophone	17	9	0	N/A
Calliope	17	0	240	N/A

Chris Brogdon
Dalton, GA

Speech synthesis—If you have a speech synthesizer, it can make Data statement debugging much easier. For example, here's how your program might read data:

```
10 FOR T = 0 TO 62 : READ Q : POKE 832 + T,Q : NEXT
```

The speech synthesizer will pronounce the numbers in your Data statements if you change this statement to:

```
10 FOR T = 0 TO 62 : READ Q$ : FOR D = 1 TO 500 : NEXT :
   SPEAK = Q$ : NEXT
```

All you have to do is follow along in the program listing, noting errors when they appear. When you've finished debugging, of course, change your program line back to its original form.

Bryan Jacques
Lyn, Ontario
Canada

28. Programs—Amusements and Delights

Special effect—This one-liner for the C-64 and C-128 will blow your socks off. Watch it run for a while, then press and hold down the space bar. You need a color display to see the full effect.

```
1 FOR X = 0 TO 1 STEP 0 : POKE 53280,3 : POKE 53280,6 : NEXT
```

After replacing your socks, you can try replacing the 3 and the 6 with different numbers.

Mark Mankins
Malvern, OH

Special effect improved—The only problem with the above trick is that you can't use it in a program because it's an infinite loop. To use it in a program, change it to look like this:

```
10 FOR X = 1 TO 500 : POKE 53280,3 : POKE 53280,6 : NEXT
```

Unknown contributor
Unknown location

Magic color change—The following short subroutine will display what you type in green, except for letters of

the alphabet, which will appear in red. Commodore 64 users might want to enter POKE 53281,1 first, to get a white screen. (128 users execute COLOR 0,2.)

```
10 GET A$: IF A$="" THEN 10
20 PRINT CHR$(28-2*(ASC(A$)<65) OR (ASC(A$)>90))A$;:GOTO 10
```

Marilyn Sallee
Alliance, NE

Character codes—To get some experience with character codes on the C-64 or C-128, try this recipe for Feminist's Delight:

```
5  POKE 53281,14:PRINT CHR$(19)CHR$(5)
10 X=X+1:PRINT CHR$(18)CHR$(69)CHR$(82)CHR$(65)
   CHR$(146)CHR$(32);:IF X<240 GOTO 10
20 GOTO 20
```

Elizabeth Oman
Lindsborg, KS

Klawretaw—We don't know who sent this, but it's well worth keying in. Can you tell what it does before running it?

```
1Ø REM KLAWRETAW - UNKNOWN MAGICIAN
2Ø A$="KLAWRETAW":FORA=9TO5STEP-1:B$=B$+MID
   $(A$,A,1):NEXT:B$=B$+B$+B$+B$
3Ø FORA=4TO1STEP-1:C$=C$+MID$(A$,A,1):NEXT
4Ø PRINTCHR$(147)CHR$(17)B$B$:FORJ=1TO35:PR
   INTCHR$(19)TAB(J)C$;:FORK=1TO5
5Ø PRINTCHR$(157):NEXT:PRINTTAB(J-1)CHR$(14
   5)" ":FORL=1TO1ØØ:NEXT:NEXT:GOTO4Ø
```

Mystery Magician
Secret City

Scintillating screenwork—This gives an especially interesting pattern on 40-column screens:

```
10 GET A$ : PRINT A$" see text "; : GOTO10
```

Between the quotes, type the *shifted* letters DDCCFRF CCDDEE. Notice their nice grouping on the keyboard. Put your machine in Graphics mode, then run the program. You can change colors by pressing the Commodore key with one of the number keys.

Other interesting patterns can be made with these shifted letters, and {COMD Y} and {COMD P} can add to the fun. My best results came from strings 13, 14 or 19 characters long.

Eric Haver
Squirrel Hill, PA

Summertime sounds—This will produce the sound of rolling waves on your computer.

```
10 REM SUMMERTIME SOUNDS - DANIEL WOODIE
20 V=54272:POKEV+6,240:POKEV+4,129:POKEV+1,34:POKEV,75
30 FORA=1TO15:POKEV+24,A:FORD=1TO50:NEXTD:NEXTA
40 FORB=15TO1STEP-1:POKEV+24,B:FORD=1TO200:
   NEXTD:NEXTB
50 FORD=1TO600+1200*RND(0):NEXTD:GOTO20
```

Here are versions for the newer machines.

```
10 REM PLUS/4 & C-16 SUMMERTIME SOUNDS—LFS
20 S=720+20*RND(1):FORV=1TO8:VOLV:SOUND3,S,V+2:
   NEXTV
30 FORV=8TO1STEP-1:VOLV:SOUND3,S,7*(8-V):NEXTV
40 SOUND3,S,250:FORD=1TO1500*RND(1):NEXTD:SOUND3,S,0:
   GOTO20
```

```
10 REM128 SUMMERTIME SOUNDS—LFS
20 ENVELOPE3,10,13,5,12,3:VOL15:TEMPO3*RND(0)+4
30 PLAY"T3W"+CHR$(65+7*RND(0))+"M":SLEEP3*RND(0):RUN
```

Daniel Woodie
Annapolis, MD

Rick-rack—Do you need something to dress up a dull screen in a program? This routine will give you a colorful rick-rack trim. After running it, you can erase the Ready prompt, then fit your printing onto the screen without using the return key. This will help you plan an aesthetic format.

```
1Ø REM{2 SPACEs}RICK-RACK BY ELIZABETH OMAN
2Ø GOTO4Ø
3Ø FORX=1TO2Ø:PRINT"{CTRL 8}{CTRL 9}{COMD *
   }{SHFT LB.}{CTRL Ø}";:NEXT:FORX=1TO2Ø:PR
   INT"{COMD *}{SHFT LB.}";:NEXT:PRINT"{COM
   D 7}{HOME}":RETURN
4Ø PRINT"{SHFT CLR}":GOSUB3Ø:FORX=1TO2Ø:PRI
   NT:NEXT:GOSUB3Ø
```

Elizabeth Oman
Lindsborg, KS

Flagrant chauvinism—The accompanying C-64 program shows the colors on your video display. Vexillologists will love the picture, in spite of the flaw in the canton.

```
1Ø REM ** FLAGRANT CHAUVINISM **
15 A$="{4 SPACEs}"+CHR$(18)
2Ø B$=CHR$(146)
25 C$="{16 SHFT SPACEs}":C$=C$+C$
3Ø D$=" * * * * * * *"
35 E$="{HOME}{3 CRSR DNs}"
4Ø F$=A$+C$
45 G$=A$+B$+C$
5Ø H$=A$+RIGHT$(D$,13)+B$
55 J$=A$+LEFT$(D$,13)+B$
6Ø POKE53265,91:POKE5328Ø,Ø:POKE53281,Ø
65 POKE53282,1:POKE53283,6:POKE53284,2
7Ø PRINT"{SHFT CLR}{CTRL 2}"E$
75 FORX=1TO6:PRINTF$CHR$(141)G$:NEXT
8Ø PRINTF$E$
85 PRINTH$,,,J$,,,H$,,,J$,,,H$,,,J$,,,H$
9Ø GOTO9Ø
```

Kevin D. Skorupa
Biloxi, MS

Designs!—Here are two short programs that will give you a swatch of fabric, wallpaper, gift-wrapping paper or a rack of Christmas neckties. They work on the C-64 or C-128. Run program #1, and you'll get an interesting repetitive pattern, chosen at random. Press any key except S, and you'll get a totally different one. Press S, and you'll get a table of numbers that are characteristic of that design. Run program #2 and enter those numbers, and you'll see the design repeated.

The possibilities in this are endless, and some of the designs are striking to behold. The odds are 2,519,040 to 1 against seeing the same one twice.

```
1ØØ REM DESIGNS! #1 - ELIZABETH OMAN
11Ø REM PRESS 'S' TO SEE SPECS
12Ø REM PRESS OTHER KEY TO SEE DESIGNS
13Ø B=INT(RND(Ø)*16):S=INT(RND(Ø)*39)+2
14Ø CH=INT(RND(Ø)*256)
15Ø CC=INT(RND(Ø)*16):IF CC=B THEN13Ø
```

Listing continued.

```
16Ø  POKE5328Ø,B:POKE53281,B:PRINT"{SHFT CLR
     }"
17Ø  FOR L=-1 TO 1ØØØ STEP S
18Ø  POKE1Ø24+L,CH:POKE55296+L,CC
19Ø  NEXT
2ØØ  GETA$:IF A$="" THEN 2ØØ
21Ø  IF A$="S" THEN 23Ø
22Ø  GOTO 13Ø
23Ø  PRINT"{CTRL 1}";:IFB=ØTHENPRINT"{CTRL 2
     }";
24Ø  PRINT"BACKGROUND="B
25Ø  PRINT"STEP="S:PRINT"CHARACTER="CH
26Ø  PRINT"CHARACTER COLOR="CC:GOTO2ØØ
3ØØ  REM DESIGNS! #2 - ELIZABETH OMAN
31Ø  INPUT"BACKGROUND (Ø-15)";B
32Ø  INPUT"{6 SPACEs}STEP (1-41)";S
33Ø  INPUT"CHARACTER (Ø-255)";CH
34Ø  INPUT"CHAR COLOR (Ø-15)";CC
35Ø  POKE5328Ø,B:POKE53281,B:PRINT"{SHFT CLR
     }"
36Ø  FOR L=-1 TO 1ØØØ STEP S
37Ø  POKE1Ø24+L,CH : POKE55296+L,CC
38Ø  NEXT
39Ø  GETA$:IFA$=""THEN39Ø
4ØØ  POKE53281,6:PRINT"{SHFT CLR}{CTRL 2}":E
     ND
```

Elizabeth Oman
Lindsborg, KS

PET Emulator—Once upon a time, most Commodore software was written for the famous PET computer. In those fond and bygone days, a powerful program called PET Emulator made the software-poor C-64 compatible with the extensive library of PET-based programs. The emulation idea was a dog, but it gave you something to do until better software appeared.

The amusing program below is much less powerful, but much more friendly. It *does* faithfully emulate a plug-compatible Commodore PET, and it works on all Commodore machines, including the C-128. Type it in right now and stand by for a pleasant surprise. Don't overlook the numerous spaces that are imbedded in the graphics strings; they appear as extra wide gaps adjacent to the curly brackets.

```
1ØØ  REM PET EMULATOR - LOUIS F. SANDER
11Ø  DIMA$(2Ø):A$=" {CTRL 9}":A$(15)="{CTRL
     3}{CTRL Ø} ."
12Ø  A$(16)="{SHFT LB.} {COMD *}":A$(17)="{C
     OMD G} {COMD M}":PRINT CHR$(142)
13Ø  A$(18)="{CTRL Ø}{CRSR LF}{COMD C}{CTRL
     9}{COMD G}{SHFT W}{COMD M}{CTRL Ø}{COMD
      V}":A$(19)=A$(17)
14Ø  A$(2Ø)="{3 COMD Is}{CTRL 1}":A$(Ø)="{SH
     FT CLR}":B$="{SHFT J}"
15Ø  C$=B$+"{2 COMD Is}{SHFT Q}{CRSR DN}{4 C
     RSR LFs} {COMD V}{COMD C} {CRSR UP}":D$
     =" {CRSR DN}{CRSR LF} {CRSR UP}"
16Ø  E$="{HOME}{19 CRSR DNs}"
17Ø  F$=E$+"{13 CRSR RTs}":G$="{SHFT U}"
18Ø  POKE5328Ø,1:POKE53281,1:FORJ=ØTO2Ø
19Ø  PRINTSPC(16)A$A$(J):NEXT:PRINTE$C$
2ØØ  FORJ=1TO13:FORK=1TO2ØØ:NEXT
21Ø  C$=D$+C$:PRINTE$C$:NEXT:FORJ=1TO1Ø
22Ø  FORK=1TO72:NEXT:PRINTF$G$
23Ø  FORK=1TO68:NEXTK:PRINTF$;B$:NEXT
```

Louis F. Sander
Pittsburgh, PA

ESP program—This little program gives the impression that your computer has ESP, or extrasensory perception. You tell your friends that your computer "knows" you and will not cooperate with anyone else. Then you load ESP, type RUN and press the return key. The program runs fine. (It also disables List, to protect our little joke.)

The first listing is for the C-64, and the second is for the C-128. The C-128 version does not disable List.

The fun starts when you ask someone to run the program. Your friend types RUN and presses the return key, but the computer refuses to obey and instead disables the keyboard! You miraculously enable it again and run the program effortlessly; anyone else who tries it will fail. The computer appears to respond only to your mystical presence.

Here's how it works. After typing RUN, you hold your finger on the return key a little longer than normal (line 30 checks for this). When your friends fail to do this, lines 80–110 cause an apparent crash. To enable the keyboard, you discreetly press the back-arrow key, which gets you out of the loop.

If your friends suspect your slow action with the return key, mislead them by pressing it normally and immediately holding down the N key. This is easy, because you just had your finger on it from typing the word RUN. When they have been mystified long enough, you press the back-arrow key while the program is running, and List is re-enabled.

This ESP trick is easy to perform, and, with a little practice and showmanship, you can baffle even the most knowledgeable computerists.

```
1Ø  REM ESP - DON THORPE
2Ø  POKE8Ø8,234:FORJ=1TO25Ø:NEXT
3Ø  IFPEEK(197)<>1ANDPEEK(197)<>39THEN8Ø
4Ø  POKE8Ø8,237:POKE775,2Ø0
5Ø  PRINT"HELLO, FRIEND.{2 SPACEs}SEE ME RUN
    !"
6Ø  IFPEEK(197)=57THENPOKE775,167
7Ø  GOTO5Ø
8Ø  PRINT:PRINT
9Ø  PRINT"BEGONE! I DO NOT KNOW YOU."
1ØØ  PRINT:PRINT"READY.":POKE2Ø4,Ø
11Ø  IFPEEK(197)<>57THEN11Ø
12Ø  WAIT2Ø7,1,1:PRINT"{3 CRSR UPs}"
13Ø  POKE8Ø8,237:POKE198,Ø


1Ø  REM ESP FOR C-128 - LOUIS F. SANDER
2Ø  TRAP3Ø:POKE2594,Ø:FORJ=1TO25Ø:NEXT
3Ø  IFPEEK(213)<>1ANDPEEK(213)<>39THEN8Ø
4Ø  TRAP
5Ø  PRINT"HELLO, FRIEND.{2 SPACEs}SEE ME RUN
    !"
6Ø  REM
7Ø  GOTO5Ø
8Ø  PRINT:PRINT
9Ø  PRINT"BEGONE! I DO NOT KNOW YOU."
1ØØ  PRINT:PRINT"READY.":POKE2599,Ø
11Ø  IFPEEK(213)<>57THEN11Ø
12Ø  WAIT2598,1,1:PRINT"{3 CRSR UPs}"
13Ø  TRAP:POKE2Ø8,Ø
```

Don Thorpe
Glenunga, South Australia

Fortune cookie—This generates some interesting messages, which *may* be useful in predicting the future. In tests against tea leaves and an out-of-round crystal ball, its output was consistently equivocal. Anyway, it's a highly amusing program. For nonstop entertainment, put a delay at the end, then skip a line and loop back to 730.

```
7ØØ REM FORTUNE COOKIE - MARCO BALAGUER
71Ø FORN=1TO1Ø:READA$(N),B$(N),C$(N),D$(N):
    NEXT:S$=CHR$(32)
72Ø DEFFNA(X)=INT(RND(Ø)*1Ø+1)
73Ø A=FNA(X):B=FNA(X):C=FNA(X):D=FNA(X)
74Ø PRINTS$A$(A)S$B$(B)S$C$(C)S$D$(D)
75Ø DATA THEY,WILL,FIND,HER,HE,WON'T,EXPOSE
    ,PLANS
76Ø DATA RIVAL,DID,IGNORE,CONSEQUENCES,STRA
    NGER,MIGHT,LOVE,YOU
77Ø DATA SHE,MIGHTN'T,ADMIRE,ANOTHER,YOU,DI
    DN'T,KNOW,THEM
78Ø DATA FAMILY,CAN'T,PROTECT,US,WE,CAN,DEN
    Y,IT
79Ø DATA CHILD,MAY,DESPISE,MONEY,SUPERIOR,C
    OULD,ACCEPT,HIM
```

Marco Balaguer
Brooklyn, NY

Sui generis—(These words are Latin for "in a class by itself"; they do describe this trick.) Trick $EE (*RUN*, October 1984) purports to translate English into Pig Latin. In true translation, words beginning with vowels do *not* have the initial letter transposed to the end; instead, the syllable "-way" is appended. Also, pure porcine philology moves initial consonant clusters to the end of the word as a group. The English "speak," therefore, is properly translated "eak-spay," rather than "peak-say," as translated by trick $EE. The accompanying program will perfectly translate any English word into Swine. Quod erat demonstrandum.

```
1ØØ REM{2 SPACEs}PIG LATIN - ANNE ABBATE
11Ø PRINT
12Ø INPUT"ENGLISH";A$
13Ø L$=LEFT$(A$,1)
14Ø IFL$="A"ORL$="E"ORL$="I"ORL$="O"ORL$="U
    "THENB$=A$:A$="-WAY":GOTO21Ø
15Ø N=2:IFL$="Q"THEN N=3:GOTO2ØØ
16Ø M$=MID$(A$,N,1)
17Ø IFM$="A"ORM$="E"ORM$="I"ORM$="O"ORM$="U
    "THEN2ØØ
18Ø N=N+1:IFN>LEN(A$)THEN11Ø
19Ø GOTO16Ø
2ØØ B$=RIGHT$(A$,LEN(A$)-(N-1)):A$="-"+LEFT
    $(A$,N-1)+"AY"
21Ø PRINT:PRINT"{2 SPACEs}SWINE: ";B$;A$
22Ø GOTO11Ø
```

Anne Abbate
Northport, NY

Editor's note: The phrase "sui generis" could also be used in the barnyard, to summon a hog named Generis. That makes it, then, in the truest sense of the word, Pig Latin.

My valentine—Listed, these lines lack logic. Run, they're redolent with sentiment. Together, they make a valentine that must be seen to be believed. So type them in for your sweetheart—you won't be disappointed.

As listed, the program works on a VIC or C-64. If you have a C-128, substitute the special line 202.

The valentine is best experienced on a well-adjusted color display with the sound turned up to max. The more you know about exponential notation, the better you'll get the message.

If you get a Typing Error message, double-check your typing on line 204. If you get an Overflow Error message, the program is working perfectly. See the Error Messages section in your user's manual.

```
1ØØ REM MAGIC VALENTINE WITH SOUND
11Ø REM CREATED BY LOUIS F. SANDER
2ØØ PRINT"{SHFT CLR}":S=54296:IFPEEK(213)=2
    1THENS=36878
2Ø2 POKE53281,1:POKE198,4:POKE631,28:POKE63
    2,211:POKE633,157:POKE634,5
2Ø4 A$="MFU!NF!DPVOU!UIF!XBZT;IPX!EP!J!MPWF
    !UIFF@":P$="{HOME}{2 SPACEs}{6 CRSR DNs
    }"
2Ø6 FORI=1TO41:J=(-1+ASC(MID$(A$,I))):K=K+J
    :B$=B$+CHR$(J):NEXT
2Ø8 IFK<>2756THENPRINT"TYPING ERROR IN A$":
    STOP
21Ø A$=MID$(B$,23):B$=LEFT$(B$,22):PRINT"{C
    RSR DN} "A$:PRINT"{CRSR DN}"B$
212 FORI=1TO33:GOSUB216:FORJ=1TO3ØØ-I{UP AR
    ROW}1.8:NEXT:NEXT
214 I=2.1*I:GOSUB216:GOTO214
216 POKES,15:POKES,Ø:PRINTP$I:RETURN

2Ø2 POKE53281,1:POKE2Ø8,4:POKE842,28:POKE84
    3,211:POKE844,157:POKE845,5:REM C-128
```

Louis F. Sander
Pittsburgh, PA

April Fool's program—When he's not looking, run this on a friend's VIC or C-64. Then get him to type a line or two, and watch the fun as he scrambles for his warranty.

```
10 POKE207,0:POKE204,0:WAIT198,1:GETA$:PRINT
   "{CTRL RVS OFF}"CHR$(ASC(A$)+1.1*RND(0));:GOTO 10
```

Don't forget the semicolon after the Print statement. Add to the fun by entering POKE808,225 (for the VIC, POKE808,100) before you run the program. (It disables the Stop, Restore and List commands.)

People have become famous by running this program at school or on machines displayed in stores.

Here is a version for the C-128.

```
10 TRAP10 : POKE2599,0:POKE2598,0:WAIT208,1:GETA$:PRINT
   "{CTRL RVS OFF}"CHR$(ASC(A$)+1.1*RND(0))
```

Larson E. Rapp
Newington, CT

Halloween disk devilment—For a real trick or treat, prepare a disk with a number of interesting programs on it, and tell a friend you're going to give it to him as a Halloween treat. Make sure it contains the following one-line program, named "DO NOT RUN ME."

```
10 OPEN 15,8,15,"N0:I WARNED YOU!,TS" : CLOSE15
```

The trick comes when he runs the forbidden program, which erases everything on the disk!

Bertram Schulman
Valley Stream, NY

Magic sprite demonstrator—This program, in versions for the C-64 and C-128, allows you to see sprites in motion on the screen. If you like a sprite it demonstrates, you can include that sprite in more sophisticated programs of your own.

To be used with the demo program, sprites are presented as Data statements. The following tricks present

some interesting sprites, which you can evaluate by using this program.

Try sending your own best sprite to Magic. Put it in our standard form—as Data statements numbered from 91–99, with line 91 containing a REM describing the sprite. In your Data items, please use leading zeroes to make each entry three characters long. (They are easier to type that way). Include a description of your sprite, but don't include Poking or animation routines.

```
1Ø REM SPRITEDEMO C-64 - LOUIS F. SANDER
2Ø POKE53281,6:PRINT"{SHFT CLR}{COMD 7}{4 C
   RSR DNs}"
3Ø FORS=832TO894:READT:POKES,T:NEXT
4Ø V=53248:POKE2Ø4Ø,13:REM SPRITE AREA
5Ø POKEV+21,1:REM DISPLAY SPRITE
6Ø POKEV+39,1:REM COLOR IT WHITE
7Ø POKEV+1,6Ø:REM Y POSITION
8Ø FORJ=1TO255:POKEV,J:NEXTJ:REM X POS
9Ø LIST

1Ø REM SPRITEDEMO 128 - LOUIS F. SANDER
2Ø PRINT"{SHFT CLR}{4 CRSR DNs}"
3Ø COLORØ,12:COLOR4,14:PRINTCHR$(153)
4Ø FORS=3584TO3647:READT:POKES,T:NEXT
5Ø SPRITE1,1,2:REM DISPLAY WHITE SPRITE
6Ø MOVSPR1,Ø#Ø:REM STOP ALL MOVEMENT
7Ø FORJ=1TO255:MOVSPR1,J,6Ø:NEXT
8Ø LIST
9Ø REM SPRITE DATA FOLLOWS:
```

Louis F. Sander
Pittsburgh, PA

That which flies—These Data statements contain a sprite that can be demonstrated by the program above. It has a lot to do with Magic, and with my own personal interests.

```
91 REM THAT WHICH FLIES - SAMUEL SEWALL
92 DATA ØØØ,ØØØ,ØØØ,ØØØ,Ø64,ØØØ,ØØØ,Ø64
93 DATA ØØØ,ØØØ,Ø96,ØØØ,ØØØ,Ø96,ØØØ,ØØ3
94 DATA 252,ØØØ,ØØØ,24Ø,ØØØ,ØØØ,Ø96,ØØ1
95 DATA 255,225,2Ø4,Ø63,255,112,124,24Ø
96 DATA 192,248,251,ØØØ,112,252,ØØØ,225
97 DATA 248,ØØØ,ØØ1,252,ØØØ,ØØ3,1Ø2,ØØØ
98 DATA Ø28,Ø99,ØØØ,12Ø,Ø97,192,248,Ø96
99 DATA ØØØ,176,112,ØØØ,Ø32,ØØØ,ØØØ,ØØØ
```

Samuel Sewall
Salem, MA

That which flies not—If you liked Judge Sewall's flying sprite, you're sure to like this one, which is often seen in the same season.

```
91 REM THAT WHICH FLIES NOT - L. SANDER
92 DATA ØØØ,ØØØ,ØØØ,ØØ5,ØØØ,ØØØ,Ø42,16Ø
93 DATA ØØØ,Ø85,Ø8Ø,ØØØ,Ø42,168,ØØØ,Ø85
94 DATA Ø8Ø,ØØØ,17Ø,168,ØØØ,Ø85,24Ø,ØØØ
95 DATA 175,252,Ø14,Ø95,255,223,Ø47,255
96 DATA 253,Ø95,255,249,Ø39,255,248,ØØ3
97 DATA 255,248,ØØ1,255,224,ØØ3,127,128
98 DATA ØØ1,13Ø,ØØØ,ØØØ,227,192,ØØØ,ØØØ
99 DATA ØØØ,ØØØ,ØØØ,ØØØ,ØØØ,ØØØ,ØØØ,ØØØ
```

Louis F. Sander
Pittsburgh, PA

Season's spritings—These sprites add festive finery to all your Christmas greenery. Though brilliant in their way, their strong points are form and symmetry. Plug them into our display programs or put them on the screen yourself.

```
81 REM CHRISTMAS SPRITE #1 - L. SANDER
82 DATA ØØØ,126,ØØØ,ØØ3,255,192,Ø15,255
83 DATA 24Ø,Ø31,255,248,Ø63,255,252,Ø63
84 DATA 255,252,127,255,254,127,255,254
85 DATA 127,255,254,127,255,254,127,255
86 DATA 254,Ø63,255,252,Ø63,255,252,Ø31
87 DATA 255,248,Ø15,255,24Ø,ØØ3,255,192
88 DATA ØØØ,126,ØØØ,ØØØ,ØØØ,ØØØ,ØØØ,ØØØ
89 DATA ØØØ,ØØØ,ØØØ,ØØØ,ØØØ,ØØØ,ØØØ,Ø13

91 REM CHRISTMAS SPRITE #2 - L. SANDER
92 DATA ØØØ,ØØØ,ØØØ,ØØØ,ØØØ,ØØØ,ØØØ,ØØØ
93 DATA ØØØ,ØØØ,Ø24,ØØØ,ØØØ,Ø24,ØØØ,ØØØ
94 DATA Ø6Ø,ØØØ,ØØØ,Ø6Ø,ØØØ,ØØØ,126,ØØØ
95 DATA Ø63,255,252,Ø15,255,24Ø,ØØ3,255
96 DATA 192,ØØØ,255,ØØØ,ØØ1,255,128,ØØ1
97 DATA 231,128,ØØ3,195,192,ØØ3,ØØØ,192
98 DATA ØØ6,ØØØ,Ø96,ØØØ,ØØØ,ØØØ,ØØØ,ØØØ
99 DATA ØØØ,ØØØ,ØØØ,ØØØ,ØØØ,ØØØ,ØØØ,Ø99
```

Louis F. Sander
Pittsburgh, PA

12-day calculator—This totals the number of gifts in the famous Christmas song. By following its logic, you can learn about nested loops.

```
100 REM 12 DAYS OF CHRISTMAS – KRINGLE
110 FOR DAY = 1 TO 12
120 FOR PRESENT = DAY TO 1 STEP – 1
130 PRINT PRESENT;
140 NUMBER = NUMBER + PRESENT
150 NEXT PRESENT
160 PRINT
170 NEXT DAY
180 PRINT "TOTAL PRESENTS = " NUMBER
```

Kris Kringle
Santa Claus, IN

Word tricks—It's well-known that shifted characters in REM statements can List in unusual ways. Having considered this quirk at length, we've created a brand-new literary form. If you run the programs below, you'll see just what we mean.

When typing them, be extremely careful with the characters in the answers; a single error can ruin the entire line. In the answer lines, we've spelled out every character following the colons, since that is the most critical area. As you type, don't put spaces where they're not called for, and carefully watch your shift and Commodore keys. In the answers, all the spaces and a few of the letters are unshifted.

After typing a program, you should save it first, then run it and follow the instructions. The quotes to be deleted are those at the beginning of the answer lines.

```
100 LIST
110 REM ** COMPUTER MAGIC & TRIVIA **
120 REM
130 REM THINK OF YOUR ANSWERS,
140 REM THEN DELETE THE QUOTES
150 REM AND RE-LIST THE PROGRAM.
160 REM
170 REM   Q:  WHY DID THE COWARDLY LION
180 REM       VISIT THE WIZARD OF OZ?
190 REM "   A: {2 SPACES}{COMD @}{SPACE}{SHIFT X}{SPACE}
               {SHIFT E}{COMD A}
200 REM
210 REM   Q:  WHO EXPOSED THE WIZARD?
```

Listing continued.

```
220 REM "   A: {2 SPACES}{COMD @}{COMD @}
230 REM
240 REM   Q:   WHAT DID THE WIZ SAY THEN?
250 REM "   A: {2 SPACES}{COMD LB.}{SPACE}{COMD @}
               {SPACE}{SHIFT B}
260 REM
270 REM   Q:   WHAT CAN A GOOD WITCH DO
280 REM        WITH A SPORTS BROOM?
290 REM "   A: {2 SPACES}{COMD -}{SPACE}{SHIFT -}
               {SPACE}A{SPACE}{SHIFT R} E.
```

Louis F. Sander
Pittsburgh, PA

Word tricks #2—

```
10 REM   Q:   WHAT DID MRS. FLINTSTONE
20 REM        SAY WHEN THE FIRE WENT OUT?
30 REM "   A: {2 SPACES}{COMD U}D, {SPACE}{SHIFT K}
               {SPACE}{COMD K}{SPACE} A {SPACE}{COMD C}
40 REM
50 REM   Q:   WHY DO LEONARD AND VALERIE
60 REM        GET A'S IN COMPUTER CLASS?
70 REM "   A: {2 SPACES}{SHIFT C}{SPACE}{COMD P}{SPACE}
               {SHIFT E}{SPACE}{SHIFT S}{SPACE}{SHIFT V}
```

Scott Shepard
Holly Hill, PA

Word tricks #3—

```
10 LIST
20 REM  Q: HOW FAR IS IT FROM THE TOP
21 REM     OF THE EMPIRE STATE
22 REM     BUILDING TO THE BOTTOM?
30 REM " A: {2 SPACES}{SHIFT -}{E}{SPACE}{SHIFT
   LB.}{SHIFT 1}
40 REM  Q: WHAT TAKES TWO (10 BINARY)?
50 REM " A: {2 SPACES}{COMD @}{SPACE}{SHIFT *}{SHIFT K}
60 REM  Q: WHAT DID THE BROKEN GUITAR
61 REM     SAY TO ITS DISTRAUGHT OWNER?
70 REM " A: {2 SPACES}{COMD LB.}{SPACE}{COMD @}
   {SPACE}{COMD U}{T}
```

Gary Forney
Oelwein, IA

Word tricks #4—This is printed here as a tribute to programming ingenuity, no matter how misdirected.

```
10 LIST
20 REM  Q: WHAT'S AN APPLECOSTA?
30 REM " A: {2 SPACES}{COMD V}
   {T}{SPACE}{A}{SPACE}{SHIFT R}{E}
```

Mike Leherr
Startzen University
Puget Sound, WV

Bad spelling—

```
300 REM   Q:   NAME DOROTHY'S CAPITAL
310 REM "   A: {2 SPACES}{COMD @}{SHIFT B} A
```

Leonard Pinth-Garnell
New York, NY

Word trick game—Here's a different approach to using shifted characters in REM statements. The object is to guess a number between 1 and 10. The answer and some clues are hidden in the REM statements. First, type in the program and save it for future use. Then, to guess a number, remove the quotes from the line having the number you've guessed. When you list the program, you'll see whether you've guessed correctly. If not, you'll get a clue or some moral support.

```
0 LIST 1-
1 REM "H {COMD J}{SPACE}{COMD Q}{SPACE}{SHIFT Q}
  {SPACE} A {SPACE}{SHIFT E} UE {SPACE}{COMD E}
  {SHIFT -} E
2 REM "{COMD £}{SPACE}{SHIFT I}
3 REM "{COMD £}{SPACE}{COMD @} O {SPACE}{SHIFT
  SPACE}
4 REM "WR {SHIFT -} G
5 REM "{COMD £}{SPACE}{COMD @}{SPACE}{COMD U} T
6 REM "{COMD K} TING {SPACE}{SHIFT SPACE}
7 REM "{COMD D}{COMD D} $ {SHIFT I}{COMD D}{COMD D}
8 REM "H {COMD J}{SPACE}{COMD Q}{SPACE}{SHIFT B}
  {SPACE}{COMD S}
9 REM "DO {SPACE}{COMD £}{SPACE}{COMD -}{SPACE}
  {COMD Q}{SPACE}{SHIFT K}{SPACE}{SHIFT M}{SPACE} IT
10 REM "H {COMD J}{SPACE}{COMD Q}{SPACE}{SHIFT Q}
   {SPACE} A {SPACE}{SHIFT E} UE {SPACE}{COMD W}
   {SHIFT R} E
```

Randy Thompson
Eugene, OR

29. Programs—Commercial Software

Making tables—If you need a table for a term paper or business report and are having trouble using a word processor to set it up, try using a spreadsheet program. The spreadsheet's features will greatly simplify the mechanics of spacing and tabulation.

Elizabeth Oman
Lindsborg, KS

Address books—If you wish to have a neat, up-to-date and correctable address and telephone book, there's an available framework in Practicalc or any similar spreadsheet.

Using the spreadsheet columns, you can enter, in any order, names, phone numbers and personal details. The columns can then be sorted alphabetically or numerically by Practicalc, and changes or corrections can be handled with ease.

Ian Haynes
Westville, South Africa

Database Deluxe improved—If you love the Database Deluxe program printed in *RUN* (February 1984) and ReRUN, but wish the printout were single spaced rather than double, make the following changes in the VIC version (C-64 owners should make the same changes to lines 740 and 790):

Line 74—Delete the CHR$(10) and change LL = LL + 2 to LL = LL + 1
Line 79—Alter the paging statement to read IF LL > 55 THEN FOR NL = LL TO 67: (rest of line is okay)

The last line printed on page 1 is 55, and 67 is the first line printed on page 2. The difference between these two numbers determines the depth of the top and bottom margins. Twelve gives a nice one-inch margin.

Lorraine Richards-May
Leesburg, IN

Doodle files from Print Shop—If you own these excellent programs, you might like to put some Print Shop lettering on the screen, then decorate the display with Doodle's superior drawing options. If you have a machine language monitor, you can do it with ease. Let's say you wrote something with Print Shop and saved it as TEXT. Just enter your monitor and do this:

```
.L "TEXT",08 (load from monitor)
.T 4000 5F3F 6000 (transfer Print Shop screen to Doodle area)
.F 5C00 5FE7 01 (add color: black)
.S "DDTEXT",08,5C00,7F3F (save, adding "DD")
```

Then, from Doodle, load TEXT and doodle to your heart's content. Of course, you can substitute any name for TEXT, as long as you add the DD when saving it as a Doodle file.

Erik Francois
Vienne, France

Print Shop files from Doodle—If you understood the trick above, you can also convert in the opposite direction. To convert a Doodle file named DDFILE into a Print Shop file named PSFILE, just:

```
.L "DDFILE",08
.T 6000 7F3F 4000
.S "PSFILE",08,4000,5F3F
```

Now you can create custom backgrounds for your Print Shop text.

Emilio Jose Espinosa III
Baldwin Park, CA

Koala files from Print Shop—Let's say you have a Print Shop Screen Magic file called PSFILE. To change it to a file you can load and embellish on your KoalaPainter, enter your machine language monitor and do this:

```
.L "PSFILE",08
.T 4000 5F3F 6000
.F 7F40 870F 01
.S "{COMD1}PICltrfilename",08,6000,8711
```

In the last line, ltr stands for any letter between A and O, and filename stands for any name you choose. The total number of characters between the quotes, including the COMD1 character, must equal 15. If your chosen filename doesn't do this, you must pad it out with spaces.

The resulting file can be loaded into KoalaPainter. There may be some superfluous dots of color, but you can easily change them to the background color by using the Color Exchange feature.

Why not save the entire character set of your favorite typeface? Then you can use KoalaPainter's Swap and Copy features to put them into your pictures.

Steven Sellors
Saint John, New Brunswick
Canada

Disabling Epyx Fast Load—This popular cartridge sometimes interferes with the loading or running of other programs. You can disable it by entering:

```
POKE 770,131 : POKE 771,164
```

This will re-enable it:

```
POKE 770,106 : POKE 771,223
```

Greg B. LaPorte
Blacksburg, VA

Fast Load re-enable—Documentation for the popular Epyx Fast Load cartridge says that once it is disabled, the only way to re-enable the cartridge is to reset the computer. I've found a second way to re-enable it. Just enter SYS 57194.

Bryan K. Davidson
Clovis, NM

Ghostbusters buster—If you like the Ghostbusters game for the C-64, but don't think $10,000 is enough to get started with, I've got some good news.

When you're asked for your name at the beginning of the game, type OWEN. When the computer asks if you have an account, answer Yes. When asked for your account number, simply type LIST. The vehicle selection screen will appear, and you'll start the game with $720,000.

Russel Swift
Address unknown

Ghostfreezers—In Activision's Ghostbusters game, one screen requires you to maneuver a ghost into a trap using laser beams. A simpler way is to align your men so they totally overlap one another, appearing to be only one man. When the ghost flies over you, press the fire-button, and the ghost will stop. Press it again and he's history.

Maurice Arkinstall
Houston, British Columbia
Canada

Jumpman jiminy—Jumpman is one of the C-64's best commercial games, with great sound and challenging multi-level screens. Unfortunately, a lot of us never get to see the higher level screens because we always run out of jumpmen. Here's a way to avoid running out.

Load the game boot and run it. Exactly 95 seconds after hitting the return key, simultaneously press the run/stop and restore keys, which will reset your machine. Your screen will be blue, and the cursor will be flashing. Now enter:

```
POKE 24015,173 : POKE 54296,15 : SYS 9*4096
```

If all is well, the Options screen should come on. Proceed normally, playing the game as usual but with one exciting difference: You'll never run out of jumpmen! When one of your men is killed, a new one appears, while the number you have left remains at seven.

Tim Tan
Winnipeg, Manitoba
Canada

Jumpman jiminy revisited—Another way to never run out of jumpmen is to insert your disk, then:

```
LOAD "INTRO*",8,1
POKE 24015,173 : POKE 54296,15 : SYS 36864
```

If you want to practice a particular screen, take a backup copy of Jumpman and rename file PLF01 to something easy to remember (PLF01 is the first screen, PLF02 is the second, and so on). Then rename your selected screen, say PLF17, as PLF01. When you load and run Jumpman, the first screen will say "Easy Does It," but, trust me, you'll get those awful

chickens to deal with. When you finally get past them, the game will go to screen 18, rather than to 2.

Marty and Dave White
Colorado Springs, CO

Making Simon simpler—If you have Simons' Basic, using the Key function can save much time while developing a program. Saving the key setup routine onto tape or disk can provide additional savings. Just define your keys, enter DISPLAY and insert a line number before each key definition. After each line number is inserted, press the return key to add your new line to the program in memory. Then save this key-definition subroutine for future use. I have several such routines—one for program development, another for running programs, and so on. Here are a few key lines to illustrate the principle:

```
58000 KEY1,"LIST" + CHR$(13)
58010 KEY2,"PAUSE 30" + CHR$(13)
58020 KEY3,"RENUMBER" + CHR$(13)
```

Susan Morrell
Lancaster, CA

Disk backup improvement—The Commodore program Single Disk Backup V1.0, by Michael Schaff, is great, but slow. If you add a sound subroutine, the program can notify you each time you need to intervene, and you can do other things while your disk is being copied. Add the following lines.

```
1000 FOR L = 54272 TO 54296 : POKE L,0 : NEXT
1010 POKE 54296,15 : POKE 54277,128 : POKE 54278,128 : POKE
     54276,33
1020 POKE 54273,50 : POKE 54272,60
1030 FOR T = 1 TO 1500 : NEXT : POKE 54276,16 : FOR T = 1 TO
     100 : NEXT
1040 FOR L = 54272 TO 54296 : POKE L,0 : NEXT
1050 RETURN
```

If you insert GOSUB 1000s in lines 465, 540, 700, 720, 725, 865, 890 and 980, the program will signal you at the appropriate times. Start the program, turn up the volume and go about your business.

The preceding changes give you only one beep as a reminder. If you prefer something that continues until you press a key, add this:

```
1035 GET A$ : IF A$ = ""THEN 1010
```

Ginger Scalet
Brookings, SD

Star Trek tip—This Sega game for the C-64 has a small bug that you can use to your advantage. The M key puts you into warp drive, which speeds you up and protects you from all enemies. When you lose warp drive energy, of course, you can no longer move faster, but that's where the bug comes in. As long as you hold down the M key, your invincibility persists. You can still use your phasers, photon torpedoes and non-warp engine power. Death to the treacherous Klingons!

David Bloyd
Reedley, CA

Star Wars trickery—If you own Star Wars the Arcade Game for the C-64, and would like a fast way to the death star, try this: Start the game and press the restore key and the space bar simultaneously. This should stop most of the fighters in their tracks and cause the rest to move in a straight line. Repeat the procedure, and all fighters should stop. Now, with the enemy disabled, kill his forces off and you should appear at the trench.

Jared Groth
Detroit, MI

Wolfenzauberei—When your Beyond Castle Wolfenstein man is killed, the computer asks you to press the space bar to restart the game. If you remove the disk before pressing the space bar, what follows is sheer magic (in German, *Zauber*); the game will restart in the position right before you died or got caught. After restarting, reinsert the disk and resume where you left off.

Darius Hatami
Mystic Islands, NJ

30. Programs—Useful Applications

Loan payments—This simple program will calculate monthly payments for various sorts of loans. Everything is lined up and rounded off, so the effect is very polished. Before counting your money, though, get confirming figures from your banker.

```
10 REM LOAN PAYMENTS - LEE MCEWEN
15 PRINT
110 INPUT"{4 SPACEs}AMOUNT OF THE LOAN";P
120 INPUT"{4 SPACEs}# MONTHLY PAYMENTS";N
130 INPUT"ANNUAL PERCENTAGE RATE";R
140 R=R/12/100
150 P=INT(100*P*R/(1-1/(1+R){UP ARROW}N)+.5
    )/100
155 P=P+.0001:P=INT(P/.01+.5)*.01
160 PRINT"YOUR MONTHLY PAYMENT IS";P
```

Lee McEwen
Pensacola, FL

Day of week routine—This routine has its origins in home computer antiquity, since a similar program appeared in *PET User Notes*, way back in 1978. It will print the day of the week for any date from March 1, 1900 through February 28, 2000. It does not destroy the date and may be used as a subroutine after the WD$ array is initialized. When you input the date, please use the numeric form of the month, day and year, using two digits for each and separating them with commas.

```
10 REM DAY OF WEEK ROUTINE
20 DATA SUN,MON,TUE,WED,THU,FRI,SAT
30 FORJ=0TO6:READWD$(J):NEXT
40 INPUT"MONTH,DAY,YEAR";MN,DY,YR
50 CY=YR:M=MN-2:IFM<1THENM=M+12:CY=CY-1
60 Y=CY-INT(CY/100)*100
70 WD=Y+INT(Y/4)+1+DY+INT(2.6*M-.1999)
80 WD=WD-INT(WD/7)*7:PRINTWD$(WD)
```

R.E. Peat
Pittsburgh, PA

Days between dates—Sometimes, such as when daily interest rates are quoted, it is useful to know the number of days between two dates. This little program can cal-

culate it for you, and we've never seen it make an error. Give it a try.

```
10Ø REM DAYS BETWEEN DATES - W. DRISCOLL
11Ø INPUT"{CRSR DN}1ST DATE (MM,DD,YYYY)";M
    ,D,Y
12Ø GOSUB17Ø:C1=C
13Ø INPUT"{CRSR DN}2ND DATE (MM,DD,YYYY)";M
    ,D,Y
14Ø GOSUB17Ø:C2=C
15Ø PRINT:PRINT"THERE ARE";C2-C1;"DAYS BETW
    EEN THEM."
16Ø END
17Ø IFM>2THENN=Ø:GOTO23Ø
18Ø Y1=INT(Y/1ØØ)
19Ø Y2=Y-Y1*1ØØ
2ØØ IFY2<>ØANDY2/4=INT(Y2/4)THENN=1:GOTO23Ø
21Ø IFY2=ØANDINT(Y1/4)=Y1/4THENN=1:GOTO23Ø
22Ø N=2
23Ø C=INT(365.25*Y)+INT(3Ø.56*M)+D+N
24Ø RETURN
```

William A. Driscoll
St. Paul, MN

Jumbles—This program will help you unscramble the Jumbles anagrams that are published in many papers. It's also handy for other anagrammatical tasks.

```
1ØØ REM JUMBLES - FRANK PANTALEO
11Ø INPUT"{SHFT CLR}{CRSR DN}WHAT'S THE JUM
    BLE";J$
12Ø LJ=LEN(J$):DIMB(LJ),J$(LJ)
13Ø PRINT"{CRSR DN}HOLD DOWN THE SPACE BAR.
    ..{CRSR DN}"
14Ø GETA$:IFA$=""THEN14Ø
15Ø FORA=1TOLJ
16Ø J$(A)=MID$(J$,A,1):B(A)=A
17Ø NEXT
18Ø C=LJ
19Ø D=INT(RND(Ø)*C+1)
2ØØ E=B(D):B(D)=B(C)
21Ø C=C-1
22Ø PRINTJ$(E);
23Ø IFCTHEN19Ø
24Ø PRINT,:IF(POS(Ø)<1)ORLJ>15THENPRINT
25Ø GETA$:IFA$=""THEN25Ø
26Ø GOTO15Ø
```

Frank Pantaleo
Elmwood Park, IL

Pushup timer—Here's a short C-64 and C-128 program that sets the tempo for doing pushups. It also makes useful calculations and offers moral support.

```
1ØØ REM PUSHUP TIMER - ROBERT MUFFLY
11Ø INPUT"{SHFT CLR}{CRSR DN} HOW MANY PUSH
    UPS TODAY{2 SPACEs}1Ø{4 CRSR LFs}";N
12Ø INPUT"{CRSR DN} SPEED (1-9){2 SPACEs}5{
    3 CRSR LFs}";S
13Ø T=TI:PRINT"{CRSR DN} YOU HAVE 5 SECONDS
     TO GET READY...{CRSR DN}"
14Ø IF(TI-T)<3ØØTHEN14Ø
15Ø GOSUB21Ø:P=P+1:PRINTP;
16Ø FORDE=1TO4ØØ*(11-S):NEXT
17Ø IFP<NTHEN15Ø
18Ø ET=INT((TI-T)/6Ø)-5:X=ET/N:SP=INT(X/Ø.1
    +Ø.5)*Ø.1
19Ø PRINT:PRINT"{CRSR DN} YOU MADE IT IN";E
    T;"SECONDS, TIGER!"
2ØØ PRINT"{CRSR DN} THAT'S";SP;"SECONDS PER
     PUSHUP.{2 CRSR DNs}":PRINT"YOU":PRINT"
    ARE{CRSR UP}":END
21Ø POKE54272,5Ø:POKE54273,6Ø
22Ø POKE54276,17:POKE54278,245
23Ø POKE54296,15
24Ø FORK=1TO1ØØ:NEXT:POKE54276,Ø
25Ø RETURN
```

Robert Muffly
Wenatchee, WA

Thermometer—This is for those who have spent so much money on their computers that they can't afford a thermometer. It relies on the folklore that crickets chirp at a rate closely determined by the temperature. Although the folklore may not be science, it *is* a scientific fact that crickets are *not* bugs. Give the program a try.

```
1ØØ REM THERMOMETER - CHARLES HOTCHKISS
11Ø PRINT"{SHFT CLR}{CRSR DN}THIS TELLS THE
     OUTSIDE TEMPERATURE"
12Ø PRINT"{CRSR DN}FROM THE NUMBER OF CHIRP
    S A CRICKET"
13Ø PRINT"{CRSR DN}MAKES IN 15 SECONDS."
14Ø PRINT"{2 CRSR DNs}YOU DO THE COUNTING,
    I DO THE COMPUTING."
15Ø PRINT"{CRSR DN}PRESS ANY KEY WHEN YOU H
    EAR THE"
16Ø PRINT"{CRSR DN}FIRST CHIRP..."
17Ø GETA$:IFA$=""THEN17Ø
18Ø PRINT"{CRSR DN}{CTRL 9} START COUNTING.
    .. "
19Ø T=TI
2ØØ IF(TI-T)>899THEN22Ø
21Ø GOTO2ØØ
22Ø PRINT"{CRSR DN}{CTRL 9} STOP!!! "
23Ø FORJ=1TO15:POKE54296,15:FORK=1TO3:NEXT:
    POKE54296,Ø:FORL=1TO3:NEXT:NEXT
24Ø INPUT"{CRSR DN}HOW MANY CHIRPS";C
25Ø C=C*4:F=((C-4Ø)/4)+6Ø:PRINT"{CRSR DN}IT
     IS";F;"DEGREES FAHRENHEIT."
```

Charles Hotchkiss
Cincinnati, OH

Printing practice—I have a five-year-old son who is just learning to form his alphabet on special lined paper. You may remember it from your own school days, with its widely spaced lines for the tops and bottoms of the capitals and its dotted line in between for the tops of the lowercase letters.

Instead of buying this paper, I wrote a short program to have my printer form the lines, just like the practice sheets, and to print my son's name at the top of the page. The listing below shows a version for Commodore printers, where CHR$(195) is the horizontal line corresponding to shifted C, and CHR$(45) is the minus sign, or dash.

If you have a different printer, it shouldn't be hard to make it print similar characters with the line spacing appropriate to your needs.

```
1ØØ REM PRINTING PRACTICE - D. BORKIN
11Ø T$="PRACTICE FOR MATTHEW"
12Ø FORJ=1TO79:SL$=SL$+CHR$(195):NEXT
13Ø FORK=1TO79:DL$=DL$+CHR$(45):NEXT
14Ø OPEN4,4
15Ø PRINT#4,SPC(4Ø-LEN(T$)/2);T$
16Ø FORJ=1TO9
17Ø PRINT#4:PRINT#4,SL$
18Ø PRINT#4:PRINT#4,DL$
19Ø PRINT#4:PRINT#4,SL$
2ØØ NEXT
21Ø CLOSE4
```

David Borkin, Jr.
Dearborn, MI

Automatic UNNEW—After a Basic program has been killed by a New or a Reset, you can use a machine language Unnew program to resurrect it. The Basic program below creates a most unusual Unnew—one that does its magic without being run. If you have a C-64 or VIC-20, plus a Commodore disk drive, you can use it to put the Unnew program on any disk you choose.

The first time you run the printed program, verify that CS = 8620; if it doesn't, you've made a mistake. Once CS = 8620, delete lines 1 and 2, then save the result, naming it Automatic UNNEW. When you run Automatic UNNEW, it will generate and save a program named UNNEW.AUTO. Once that program is on your disk, you can resurrect any NEWed program by entering:

```
LOAD"UNNEW.AUTO",8,1
```

As soon as the load is finished, your lost program will reappear, intact; there's no need to type RUN or SYS.

```
1 FORJ=1TO68:READX:CS=CS+X:NEXT
2 PRINT"CS="CS"(SHOULD BE 8620)":STOP
10 REM AUTOMATIC UNNEW - ERIC HAVER
20 OPEN2,8,2,"UNNEW.AUTO,P,W"
30 PRINT#2,CHR$(128);CHR$(1);
40 READA
50 IFA<>234THEN PRINT#2,CHR$(A);:GOTO40
60 FOR J=1 TO 70:PRINT#2,CHR$(2);:NEXT
70 PRINT#2,CHR$(A);:READ A:IFA>0THEN 70
80 CLOSE 2
91 DATA 160,003,200,177,043,208,251,200
92 DATA 200,152,160,000,145,043,165,044
93 DATA 200,145,043,133,060,160,000,132
94 DATA 059,162,000,200,208,002,230,060
95 DATA 177,059,208,245,232,224,003,208
96 DATA 242,200,208,002,230,060,132,045
97 DATA 164,060,132,046,032,089,166,032
98 DATA 051,165,076,116,164,234,234,234
99 DATA 076,128,001,000
```

Eric Haver
Pittsburgh, PA

Load address finder—This short program finds the load address for any program saved on disk and is useful for investigating machine language files. It gives the load address plus the low byte and high byte of that address—all in decimal form. Since many machine language programs are executed by a SYS command to their first byte, knowing the load address is often the same as knowing the enabling SYS.

```
10 REM LOAD ADDR - M. TRANCHEMONTAIGNE
20 INPUT "{7 SPACEs}FILENAME";F$
30 OPEN2,8,2,F$+",P,R"
40 GET#2,LO$ : LO$=LO$+CHR$(0)
50 GET#2,HI$ : HI$=HI$+CHR$(0)
60 CLOSE2 : LA=ASC(LO$)+256*ASC(HI$)
70 PRINT"LOAD ADDRESS IS:" LA
80 PRINT"{4 SPACEs}LOW BYTE IS:" ASC(LO$)
90 PRINT"{3 SPACEs}HIGH BYTE IS:" ASC(HI$)
```

Mike Tranchemontaigne
Nashua, NH

End address finder—You can find the ending address of a C-64 or VIC program on disk or tape by using Verify, then Peeking the pointer at 174–175. To find the highest address into which the program loads, verify it, then enter:

```
EA = PEEK(174) + 256*PEEK(175) - 1:PRINT EA
```

If you also know the load address, you can find the length of the program by:

```
Length = 1 + End Address - Load Address
```

Douglas Marshall
Bell, CA

Automatic appender—Use this program to append other ones, with no Direct mode Pokes to fool around with. Here is a version for the C-64 and VIC, and another for the C-128.

Make sure your disk has a copy of your main program and the programs you wish to append. Run this program, entering the name of your main program in response to the first prompt. (The first line number in the main program must be higher than 6.) Then enter the device number of the drive your disk is in.

To append to the main program, run the automatic appender again, this time answering the first prompt with the name of the next program to append. Its line numbers must all be higher than the last line number in the main program. You may continue to append as many programs as you wish, provided their line numbers are all higher than those in the program currently in memory.

When you've finished, remove lines 1–6, then save your combined programs.

```
1 INPUT"PROGRAM TO APPEND";A$:INPUT"{5 SPAC
  Es}DRIVE 8 OR 9";U: REM C-64 & VIC-20
2 A=PEEK(44):PRINT"{SHFT CLR}{3 CRSR DNs}LO
  AD";CHR$(34);A$;CHR$(34);CHR$(44);U
3 PRINT"{4 CRSR DNs}POKE43,1:POKE44,";A;"{H
  OME}"
4 POKE632,13:POKE633,13:POKE634,13:POKE198,
  3
5 IFPEEK(45)<2THENPOKE43,PEEK(45)-2+255:POK
  E44,PEEK(46)-1:END
6 POKE43,PEEK(45)-2:POKE44,PEEK(46):END

1 INPUT"PROGRAM TO APPEND";A$:INPUT"{5 SPAC
  Es}DRIVE 8 OR 9";U: REM C-128 VERSION
2 A=PEEK(46):PRINT"{SHFT CLR}{3 CRSR DNs}LO
  AD";CHR$(34);A$;CHR$(34);CHR$(44);U
3 PRINT"{4 CRSR DNs}POKE45,1:POKE46,";A;"{H
  OME}"
4 POKE842,13:POKE843,13:POKE844,13:POKE208,
  3
5 IFPEEK(4624)<2THENPOKE45,PEEK(4624)-2+255
  :POKE46,PEEK(4625)-1:END
6 POKE45,PEEK(4624)-2:POKE46,PEEK(4625):END
```

Alan Leish
Address unknown

Trace utility—The accompanying program traces the execution of any Basic program, a procedure that can dramatically ease debugging. As printed, Trace is for the C-64. For the VIC, change 189 to 221 in line 840. After you've typed in the program, enter in Direct mode:

```
FOR X = 1 TO 54 : READ Y : Z = Z + Y : NEXT : PRINT Z
```

The computer should print 6341 for the C-64 version; 6373 for the VIC. Any other number means there's an error in your Data statements. Once the proper number is printed, save Trace on disk or tape.

Running Trace puts a machine language program into memory, and displays its controlling SYS commands on

the screen. You should record these commands for future reference. Type SYSxxx{return}, where xxx is the appropriate number from the screen display, to either enable or disable the tracing function. While enabled, Trace will print the line number of each Basic statement as it is executed. To trace a program, first load and run Trace. Then load a Basic program, enable Trace, and run the Basic. Tracing the following test program will give you a good understanding of Trace's workings.

```
10 PRINT "A" : PRINT "B" : X = 5 : Y = 6
20 PRINT "C" : PRINT "D" : Z = 7
```

Notice how four statements are traced in line 10, plus three in line 20.

To get a hard copy of what you're tracing, add this line at the start of the program being traced:

```
5 OPEN 4,4 : CMD4
```

You can make Trace's SYS calls a part of the traced program, to limit tracing to those parts where it is needed. Try enabling/disabling Trace before/after one of the Print statements in the test program, and you'll see how this feature can be used.

As printed, Trace's machine language resides in the cassette buffer, where any tape activity will overwrite it. But the machine language is completely relocatable; to put it in a protected area at the top of memory, add:

```
115 POKE 56,PEEK(56) - 1 : CLR : S = 5 + PEEK(56)*256
125 A = INT(S/256):B = S - (A*256):POKE S + 38,A:POKE S + 33,B
```

```
1ØØ PRINT"{SHFT CLR}TRACE UTILITY - MAGIC{C
    RSR DN}"
11Ø S=828: REM RELOCATABLE START ADDR
12Ø FORX=S TO S+53:READ Y:POKEX,Y:NEXT
125 A=INT(S/256):B=S-(A*256):POKES+38,A:POK
    ES+33,B
13Ø PRINT"SYS";S+22;"ENABLES,"
14Ø PRINT"SYS";S+43;"KILLS."
828 DATA 165,Ø58,2Ø1,255,24Ø,Ø13
834 DATA 169,Ø6Ø,Ø32,21Ø,255,Ø32
84Ø DATA 2Ø1,189,169,Ø62,Ø32,21Ø
846 DATA 255,1Ø8,251,ØØØ,173,ØØ8
852 DATA ØØ3,133,251,173,ØØ9,ØØ3
858 DATA 133,252,169,Ø6Ø,141,ØØ8
864 DATA ØØ3,169,ØØ3,141,ØØ9,ØØ3
87Ø DATA Ø96,165,251,141,ØØ8,ØØ3
876 DATA 165,252,141,ØØ9,ØØ3,Ø96
```

Stanley Tobojka
New Bedford, MA

Memory Scope—The accompanying program will display one page of memory at the top of your computer's screen. Unlike a machine language monitor, the Memory Scope display changes along with the contents of memory, letting you see what happens as keys are pressed or Basic statements are executed.

The main listing below is a Memory Scope for the C-64. If you use a Plus/4, C-16 or VIC-20, you should type in the C-64 version, then add the changed lines as shown. If you have a C-128, type in the entire C-128 version.

A memory page is a 256-byte block of memory, and pages start at integral multiples of 256. The pages with low numbers and those with high numbers are the most interesting to explore; there are no pages numbered greater than 255. To find the page number of any address, divide it by 256 and drop everything after the decimal point.

In the display, the characters have their screen Poke values: @ = 0, A = 1, B = 2, and so on. A complete listing appears under Screen Display Codes in the back of your user's manual. If your cursor disappears while using Memory Scope, it's probably hiding behind the display. Cursoring down will bring it back into view.

Memory Scope is a simple but powerful tool for understanding your computer's operation.

```
1 REM MEMORY SCOPE - LOUIS F. SANDER
2 REM C-64 VERSION
3 DATA 12Ø,169,145,141,Ø2Ø,ØØ3,169,ØØ3
4 DATA 141,Ø21,ØØ3,Ø88,Ø96,173,136,ØØ2
5 DATA 141,158,ØØ3,162,ØØØ,189,ØØØ,ØØØ
6 DATA 157,ØØØ,ØØ4,2Ø2,2Ø8,247,162,ØØØ
7 DATA 173,134,ØØ2,157,ØØØ,216,2Ø2,2Ø8
8 DATA 25Ø,Ø76,Ø49,234,4764
1Ø FORJ=1TO44:READK:CS=CS+K:NEXT:READCK
2Ø RESTORE:IFCS<>CKTHENPRINT"BAD!":STOP
3Ø FORJ=9ØØTO943:READK:POKEJ,K:NEXT
4Ø V$="{SHFT CLR}{6 CRSR DNs}":W$="{CRSR DN
   }":X$="RESTORE"
5Ø PRINTV$TAB(18)"POKE923,N - SYS9ØØ"W$
6Ø PRINT"POKE923,N TO SEE MEMORY PAGE N
7Ø PRINT"{CRSR DN}TO KILL THE DISPLAY, PRES
   S
8Ø PRINTX$" WHILE PRESSING {CTRL 9}STOP{CTR
   L Ø}
9Ø PRINT
1ØØ PRINT"TO REACTIVATE, DO A SYS9ØØ
11Ø SYS9ØØ:PRINT:PRINT

2 REM PLUS/4 & C-16 CHANGES
4 DATA 141,Ø21,ØØ3,Ø88,Ø96,173,Ø62,ØØ5
7 DATA 173,Ø59,ØØ5,157,ØØØ,ØØ8,2Ø2,2Ø8
8 DATA 25Ø,Ø76,Ø14,2Ø6,435Ø
4Ø V$="{SHFT CLR}{6 CRSR DNs}":W$=CHR$(141
   +CHR$(27)+"T"+CHR$(19):X$="RESET"
9Ø PRINT"THEN TYPE X <RETURN>":PRINT

2 REM VIC-2Ø CHANGES
4Ø POKE937,PEEK(244)-1:POKE942,191
5Ø PRINT"{SHFT CLR}{12 CRSR DNs}"
6Ø PRINT"POKE923,N SHOWS PAGE N"
7Ø PRINT"STOP/RESTORE KILLS"
8Ø PRINT"{CRSR DN}SYS9ØØ REACTIVATES"
9Ø SYS9ØØ:END

1 REM MEMORY SCOPE - LOUIS F. SANDER
2 REM C-128 VERSION
3 DATA 78,A9,19,8D,14,Ø3,A9,ØB
4 DATA 8D,15,Ø3,58,6Ø,A2,ØØ,BD
5 DATA ØØ,ØØ,9D,ØØ,Ø4,CA,DØ,F7
6 DATA A2,ØØ,AD,F1,ØØ,9D,ØØ,D8
7 DATA CA,DØ,FA,4C,9B,F9,ØØ,ØØ
1Ø FORJ=1TO4Ø:READK$:L=DEC(K$):CS=CS+L:NEXT
   :RESTORE:IFCS<>4265THENSTOP
2Ø FORJ=2828TO2867:READK$:POKEJ,DEC(K$):NEX
   T
3Ø PRINT"{SHFT CLR}{6 CRSR DNs}"TAB(18)"POK
   E2845,N - SYS2828"CHR$(141)+CHR$(27)+"T"
   +CHR$(19)
4Ø PRINT"POKE2845,N TO SEE MEMORY PAGE N
5Ø PRINT"{CRSR DN}TO KILL THE DISPLAY, PRES
   S
6Ø PRINT"RESTORE WHILE PRESSING {CTRL 9}STO
   P{CTRL Ø}
7Ø PRINT"{CRSR DN}TO REACTIVATE, DO A SYS28
   28
8Ø SYS2828:PRINT:PRINT
```

Louis F. Sander
Pittsburgh, PA

Screen Poke finder—When you're Poking characters to the C-64 or C-128 screen, determining the Poke addresses is *not* part of the fun. That's why I created the Poke Finder program. Type the appropriate listing in

and run it, and if your Data statements are perfect, you'll see the instructions. Otherwise, find your typing error and correct it.

Note the instructions. Then NEW the program. Then you're free to program or to cursor around the screen, leaving, if you're skillful, a trail of truth and beauty. To find the memory locations for any screen position, just move your cursor there and press the f1 key. Like magic, the numbers will materialize on screen! And since Poke Finder doesn't interfere with Basic, you can use its services while writing other programs. Simultaneously pressing the run/stop and restore keys kills Poke Finder, while entering the proper SYS resurrects it.

```
10 REM 64 SCREEN POKE FINDER - C.CONLEE
11 PRINT"{SHFT CLR}{2 CRSR DNs} WORKING..."
12 FORJ=1TO180:READK:CS=CS+K:NEXT
13 IFCS<>25844THENPRINT"DATA ERROR":STOP
14 RESTORE:FORJ=49152TO49331:READK:POKEJ,K:
   NEXT
15 PRINT"{SHFT CLR}{2 CRSR DNs}USE THE F1 K
   EY TO FIND THE SCREEN AND"
16 PRINT"COLOR POKE LOCATIONS FOR THE CURRE
   NT"
17 PRINT"CURSOR POSITION."
18 PRINT"{CRSR DN}STOP/RESTORE KILLS THE FE
   ATURE,"
19 PRINT"SYS49152 RESURRECTS IT.{CRSR DN}"
20 SYS49152
21 DATA 120,169,013,141,020,003,169,192
22 DATA 141,021,003,088,096,072,138,072
23 DATA 152,072,165,215,201,133,240,003
24 DATA 076,172,192,056,032,240,255,140
25 DATA 180,192,142,181,192,169,000,141
26 DATA 182,192,169,004,141,183,192,224
27 DATA 000,240,020,024,169,040,109,182
28 DATA 192,141,182,192,169,000,109,183
29 DATA 192,141,183,192,202,208,236,024
30 DATA 173,180,192,109,182,192,141,182
31 DATA 192,169,000,109,183,192,141,183
32 DATA 192,024,173,182,192,105,000,141
33 DATA 184,192,173,183,192,105,212,141
34 DATA 185,192,024,162,000,160,024,032
35 DATA 240,255,169,083,032,210,255,169
36 DATA 061,032,210,255,174,182,192,173
37 DATA 183,192,032,205,189,169,044,032
38 DATA 210,255,169,032,032,210,255,169
39 DATA 067,032,210,255,169,061,032,210
40 DATA 255,174,184,192,173,185,192,032
41 DATA 205,189,024,174,181,192,172,180
42 DATA 192,032,240,255,104,168,104,170
43 DATA 104,076,049,234


50 REM 128 SCREEN POKE FINDER - L.SANDER
60 PRINT"{SHFT CLR}{2 CRSR DNs} WORKING..."

70 FORJ=1TO184:READK$:L=DEC(K$):CS=CS+L:NEX
   T:RESTORE:IFCS<>21451THENSTOP
80 FORJ=2816TO2999:READK$:POKEJ,DEC(K$):NEX
   T
90 PRINT"{SHFT CLR}{2 CRSR DNs}USE THE F1 K
   EY TO FIND THE SCREEN AND"
100 PRINT"COLOR POKE LOCATIONS FOR THE CURR
    ENT"
110 PRINT"CURSOR POSITION."
120 PRINT"{CRSR DN}STOP/RESTORE KILLS THE F
    EATURE,"
130 PRINT"SYS2816 RE-ENABLES IT.{CRSR DN}"
140 KEY1,CHR$(133):SYS2816
150 DATA 78,A9,0D,8D,14,03,A9,0B
160 DATA 8D,15,03,58,60,48,8A,48
170 DATA 98,48,A5,F0,C9,85,F0,03
180 DATA 4C,AC,0B,38,20,F0,FF,8C
190 DATA B4,0B,8E,B5,0B,A9,00,8D
200 DATA B6,0B,A9,04,8D,B7,0B,E0
210 DATA 00,F0,14,18,A9,28,6D,B6
220 DATA 0B,8D,B6,0B,A9,00,6D,B7
230 DATA 0B,8D,B7,0B,CA,D0,EC,18
240 DATA AD,B4,0B,6D,B6,0B,8D,B6
250 DATA 0B,A9,00,6D,B7,0B,8D,B7
260 DATA 0B,18,AD,B6,0B,69,00,8D
270 DATA B8,0B,AD,B7,0B,69,D4,8D
280 DATA B9,0B,18,A2,00,A0,18,20
290 DATA F0,FF,A9,53,20,D2,FF,A9
300 DATA 3D,20,D2,FF,AE,B6,0B,AD
310 DATA B7,0B,20,F6,8D,A9,2C,20
320 DATA D2,FF,A9,20,20,D2,FF,A9
330 DATA 43,20,D2,FF,A9,3D,20,D2
340 DATA FF,AE,B8,0B,AD,B9,0B,20
350 DATA F6,8D,18,AE,B5,0B,AC,B4
360 DATA 0B,20,F0,FF,68,A8,68,AA
370 DATA 68,4C,9B,F9,00,00,00,00
```

Chris Conlee
Moro, OR

Sort subroutine—You can use the accompanying subroutine to sort the items in any one-dimensional array. When called, it will sort string array S0$( ) into ascending order. Before calling it, you must make entries into S0$( ), then set variable S1 equal to the highest subscript of the entries you've made. S0$( ) can be dimensioned to any size, but only items S0$(1) through S0$(S1) will be sorted. S0$(0) is not sorted, nor is it counted in S1.

```
39999 REM ** MAGIC SORT SUBROUTINE **
40000 S2=S1
40001 S2=INT(S2/2) : IF S2=0 THEN 40009
40002 S3=1 : S4=S1-S2
40003 S5=S3
40004 S6=S5+S2 : IF S0$(S5)<S0$(S6) THEN 40007
40005 S7$=S0$(S5) : S0$(S5)=S0$(S6) : S0$(S6)=S7$ : S5=S5-
      S2 : IF S5<1 THEN 40007
40006 GOTO 40004
40007 S3=S3+1 : IF S3>S4 THEN 40001
40008 GOTO 40003
40009 RETURN
```

For your protection, the subroutine uses variables with unusual names; avoid using them in the rest of your program, and you'll avoid interference with the sort.

To sort into descending order, change the "less than" symbol in line 40004 to a "greater than" symbol. To sort an array other than S0$( ), change all the S0s in 40004 and 40005 to the name of the new array. To sort a numeric array S0( ), delete all the dollar signs in lines 40004 and 40005.

You can use the following program to test your subroutine.

```
10 FOR I=0TO9:READS0$(I):PRINTI;S0$(I):NEXT:PRINT
20 S1=9:GOSUB40000:FORI=0TO9:PRINTI;S0$(I):NEXT:END
30 DATA ZERO,H,A,I,G,D,B,C,F,E
```

Titania Queen
Staten Island, NY

Disk de-banger—When using copy-protected programs, the copy-protection scheme can create a lot of disk-head bumping, as evidenced by the 1541's machine-gun sound effects. The banging tends to knock drives out of alignment or to kill them before their time.

If you run the following program before loading any DOS-protected software, most of the banging will stop.

```
10 OPEN 15,8,15
20 PRINT#15,"M-W";CHR$(106)CHR$(0)CHR$(1)CHR$(133)
30 CLOSE 15
```

The de-banger will stay in effect until the drive is powered down.

Gilbert D. Helland
Scott AFB, IL

Disk ID changers—A disk's two-character ID is recorded once in the directory and once on each disk sector. If you have inadvertently given two disks the same ID, you can use the following routine to change the directory, which will avoid most of the problems of duplicate IDs. Use spaces where they are shown in the Print# statements, and don't forget the semicolon at the end of line 50.

```
10 OPEN 15,8,15,"I0" : OPEN 2,8,2,"#"
20 INPUT "NEW ID";ID$
30 PRINT#15,"U1:2 0 18 0"
40 PRINT#15,"B-P:2 162"
50 PRINT#2,ID$;
60 PRINT#15,"B-P:2 0"
70 PRINT#15,"U2:2 0 18 0"
80 PRINT#15,"I0"
90 CLOSE2 : CLOSE15
```

By adding these lines, the program can be changed to restore the disk's original ID. Note the new line 20.

```
20 PRINT#15,"M-R"CHR$(18)CHR$(0)CHR$(2)
25 GET#15,A$,B$ : ID$ = A$ + B$
```

Mark Niggemann
Ames, IA

Write-protect detector—This routine detects if your disk has its write-protect notch covered. It reads bit 4 of a port at $1C00 on the disk controller; if the bit is set, the write-protect notch is open.

```
10 OPEN 15,8,15
20 PRINT#15, "M-R"CHR$(0)CHR$(28)
30 GET#15,A$ : A = ASC(A$ + CHR$(0)) AND 16
40 IF A = 0 THEN PRINT "WRITE PROTECTED"
50 CLOSE 15
```

Mark Niggemann
Ames, IA

Sequential file reader—The following program lets you examine the contents of sequential files on disk, making it very useful in debugging. Before entering the name of the file you want to inspect, be sure that that file is on the disk in your drive. Then enter its name and watch the screen as the program steps through your file.

Use the space bar to advance through the file. Press any other key to terminate the program. When you reach the end of the file, the program terminates automatically.

```
10Ø REM SEQ FILE READER-LOUIS F. SANDER
11Ø OPEN15,8,15
12Ø PRINT:INPUT"{SHFT CLR}FILENAME TO READ"
    ;F$
13Ø OPEN2,8,2,F$+",S,R":PRINT:GOSUB28Ø
14Ø PRINT"{CRSR DN}HIT SPACE TO SEE NEXT BY
    TE,"
15Ø PRINT"HIT ANY OTHER KEY TO QUIT."
16Ø PRINT"{CRSR DN}{CTRL 9}BYTE#{2 CRSR RTs
    }CHR${CRSR RT}ASCII"
17Ø J=J+1
18Ø GET#2,A$:A$=LEFT$(A$+CHR$(Ø),1)
19Ø A=ASC(A$):B$=A$
2ØØ IFA$<CHR$(32)THENB$="{CRSR LF}N/A"
21Ø IFA$>CHR$(127)THENIFA$<CHR$(16Ø)THENB$=
    "{CRSR LF}N/A"
22Ø PRINTTAB(3);J;TAB(7);A;TAB(14);B$
23Ø IFST>19THEN26Ø
24Ø GETC$:IFC$=""THEN24Ø
25Ø IFC$=CHR$(32)THEN17Ø
26Ø CLOSE2:CLOSE15:END
27Ø REM ** DISK ERROR CHECK
28Ø INPUT#15,EN,EM$,ET,ES
29Ø IFEN=ØTHENRETURN
3ØØ PRINTEN;EM$;ET;ES:GOTO26Ø
```

Louis F. Sander
Pittsburgh, PA

32. Word Processing

Magic word processor—Here's a rudimentary but elegant word processor for any Commodore machine. It loads in a flash and lets you type and edit single lines, which then list to the printer whenever you press the return key. This ultra-convenient program works well with my 1526 printer, even reproducing the Commodore key graphics symbols.

To use this mini word processor, you first customize it for your own machine by adding the proper line 20 (see lines 100–420). When you run the program and select your margin settings, you'll see an 80-column print line, with margin areas highlighted by crosshatching. Type whatever you want, using the delete key to make corrections. You can type past the right margin at any time, and you can use the delete key as a left-margin release.

Notice that all keys repeat, and that cursor controls and other non-printing keys are disabled. To print your line of text, press the return key, then begin typing the next line. To skip a line, press the return key again. To exit the program, press the stop key. If you exit by mistake, type CONT <return>, and continue where you left off.

Here are some fine points on working with the program: Line 15 sets the colors, which you can easily change to suit your taste. P$ is the prompt color, while C$ is the character color. Screen and border colors are set in the usual way.

If you don't have a Commodore printer, you may have to customize line 95. Set it up so your printer prints T$ in upper- and lowercase. If you have a C-128, Plus/4 or C-16, your function keys can be used to type words or phrases. Use the Key command to set them up.

Finally, a few cautions. Avoid asking for margins outside the 0–80 range, or for left margins higher than right ones, because doing so will confuse the program. Also be careful if you save the program from one computer model and load it into another, since the process may change some keywords, especially the Color in line 420.

```
1Ø PRINT"{SHFT CLR}MAGIC WP - LOUIS F. SAND
   ER"
15 POKE36879,1Ø4:POKE5328Ø,14:POKE53281,6:C
   $="{CTRL 2}":P$="{CTRL 5}":S$="{CRSR UP}
   ":PRINTCHR$(14)
2Ø REM***{2 SPACEs}SEE LINES 1ØØ-{2 SPACEs}
   ***
25 IFPEEK(Ø)=76THENS$=CHR$(141)+"{4 CRSR UP
   s}"
3Ø INPUT" LEFT MARGIN{3 SPACEs}5{3 CRSR LFs
   }";LM
35 INPUT"RIGHT MARGIN{3 SPACEs}75{4 CRSR LF
   s}";RM
4Ø T$="":PRINTP$:IFRM>8ØTHEN3Ø
45 FORJ=1TOLM:T$=T$+" ":PRINT"{COMD LB.}";:
   NEXT
```

→

Listing continued.

```
5Ø  FORJ=JTORM-1:PRINT"{COMD @}";:NEXT:FORJ=
    JTO8Ø:PRINT"{COMD LB.}";:NEXT:PRINTC$"{C
    RSR UP}";S$;TAB(LM)
55  POKEQF,Ø:PRINTC$;"{COMD @}{CRSR LF}";
6Ø  GETA$:IFA$=""THEN6Ø
65  IFA$=CHR$(13)THENPRINTP$;"{COMD @}";:GOT
    O95
7Ø  IFA$=CHR$(2Ø)ANDLEN(T$)THEN9Ø
75  IFA$<CHR$(32)THEN55
8Ø  IFA$>CHR$(127)ANDA$<CHR$(16Ø)THEN55
85  T$=T$+A$:PRINTA$;:GOTO55
9Ø  T$=LEFT$(T$,LEN(T$)-1):PRINTP$;"{COMD @}
    {2 CRSR LFs}";:GOTO55
95  OPEN4,4,7:PRINT#4,T$:CLOSE4:GOTO4Ø
1ØØ :
11Ø REM LINE 2Ø FOR VARIOUS MACHINES:
12Ø QF=212:POKE65Ø,128:REM C-64 & VIC
22Ø QF=244{12 SPACEs}:REM C-128 4Ø COL
32Ø QF=244:S$=""{6 SPACEs}:REM C-128 8Ø COL
42Ø QF=2Ø3:COLORØ,7,Ø :REM PLUS4 & C-16
```

Louis F. Sander
Pittsburgh, PA

Automatic setups—Often there are setup steps you need to take before loading your word processor. Typical are locking the interface and executing a no-head-knock routine. If your word processor is one of the large number that use a short Basic loader program to boot in the main machine language code, take heart. You can usually change the boot program to include these initial setup activities.

If your word processor doesn't use a boot, just make one up yourself. Have it do your setups before it loads and runs the main program.

Karl D. Laun
Wichita, KS

Printer setup tip—Most word processors have setup routines to configure themselves for the type of printer being used. If you're using a Cardco or other parallel printer interface, be very careful in answering the setup questions. If your interface plugs into the computer's serial interface, tell the word processor that you have a *serial* printer.

Even though the printer itself is a parallel printer, the computer is communicating with the interface, which is a serial device.

Bruce Sides
Florence, AL

DIP switch tip—Most DIP switches select the printer features that will be enabled at power-up. If your word processor requires different features than you usually have enabled, there's no need to change the switches when you run it. Almost invariably, software commands are available to change the settings away from their power-up values. Reading your printer manual will generally reveal them, and reading your software manual will generally tell how to send them.

Bertram Schulman
Valley Stream, NY

Setup files—Most word processors have features by which you can pick out certain print formats, display modes, special keys, etc. After you've been using your word processor for a while, you'll find yourself repeatedly using the same group of features, usually with identical settings. Make up a file that includes only these commands, then save it with a descriptive filename such as Setup. Then, when beginning a new document, just load Setup and append your new material.

Andrew Rogosin
Queens Village, NY

Text centering tip—When using a word processor, it's sometimes desirable to center a block of text as a unit, rather than line by line. For instance, if you wanted to center:

From: J. Lee
Riverside, CA
To: Alexander Papatheophilus
Greece

you'd want to do it as shown, with "From" directly above "To" and the first letters of the names and addresses lined up.

But with most word processors, each line would be individually centered, and the results would be chaotic. A solution is at hand if your word processor recognizes what is called a hard space. (In PaperClip and others, you get a hard space by typing a shifted space.)

If you turn on centering, but use hard spaces for the leading and trailing spaces, the whole block will be centered as a unit. In the above example, when typing the last line, you'd use hard spaces from under the T in To to the G in Greece and from the last letter in Greece until you were under the last letter of Al's last name.

Jerry W. Lee
Riverside, CA

Indenting outlines—When typing an outline or other document with several levels of indentation, keeping the indentation straight is mentally and visually confusing. Hence, a trick to help.

Instead of indenting as you type, use unusual character strings. When you're finished typing, use your Search and Replace option to replace these strings with the proper number of spaces. For the unusual characters, I use symbols like ##, %%, @@, and so on.

G. Scott Wright
Albany, NY

Word processor glossary—Dedicated office word processors often provide a glossary function that allows frequently used words and phrases to be recalled by a two-letter code. This function can be approximated on any word processor that offers the Search and Replace feature. As the document is typed, use a two- or three-letter acronym. Then go back and search and replace every acronym with the desired phrases. For example, I used MRC in a report where I needed to use the phrase "Microcomputer Resource Center" numerous times.

Jo Ann Strohn
Dublin, OH

Wordpro parentheses—With many printers, you get more readable copy if you use spaces to separate parentheses from the material they enclose. But sometimes that

leaves you with a dangling parenthesis (one that sits by itself at the beginning or end of a printed line). To avoid the problem, try using shifted spaces to separate your parentheses. With Wordpro, and perhaps with other word processors, the computer treats the shifted space as an invisible letter and will not break a line on it.

You can also use this trick to make the line break occur where you want it in the printout. Just be sure you don't type too long a line of words and shifted spaces. If the combination won't fit on a single line, you'll abort printing and get an error signal.

Sarah Knutti
Bethesda, MD

Address files—I keep a disk filled with address files in the format of my word processor. Each time I type a letter, I start by trying to load the file for my addressee. If it's there, it loads. If it isn't, I type the address, then save it using the save-range feature.

By keeping all the addresses on one disk, I can use the disk as an address book that's compatible with my word processor. When I want to make printouts of selected addresses, I append them one by one, then save and print the resulting file.

Mike Randell
Vernon, British Columbia
Canada

Easy Script tip—Since this program uses the left-arrow key for cursor control, it's not readily apparent what to do if you want to put a left-arrow character in your text. Control 7 will do the job.

Michael A. Packer
Washington, WV

Easy Script directories—To get hard copies of a group of disk directories, load Easy Script, then go to Disk mode by pressing f4. Put the first disk in the drive and type +$0, which will put its directory into the text section. For the next disk, move the cursor to the bottom of the first listing, then repeat the above steps. Continue until all directories have been added to the text section, then print them out just as you would any document.

With this method, all of Easy Script's editing and formatting commands are available for your use. Also, for the benefit of those whose printers can't handle that mode, the disk headers are not printed in reverse field.

R.S. Michaelis
Marietta, OH

Easy Script and interfaces—Many printer interfaces require setup commands to be sent to special secondary addresses. Easy Script has a feature that does this with ease. Just execute a Format command of the form

{f3}sa,N,D,D,D . . . <return>

{f3} means to press the f3 key, which prints on the screen as a reverse field asterisk. The letters "sa" are the command, and N is the number of the secondary address in question. The Ds, of which there may be as many as 20, represent the CHR$ values of characters to be sent to the secondary address.

To send the string "ABC" to secondary address 23, for example, you would execute

{f3}sa,23,65,66,67 <return>

Ronald J. Keating, Jr.
Laplace, LA

Easy Script and printer codes—The f1 and numeric keys can be used to send special codes to the printer. For example, you can make f1/1 send a CHR$(14) by executing the Format command f3/1 = 14. (Don't type the slashes—they're only used as separators.) For details, see the Special Characters section of your manual.

I keep a special-codes file on disk, which contains the Format commands to set up keys 1–0 to control my printer's special features. Each command includes a comment that defines the key's function in English. For easy remembering, the keyboard is set up so that the keys enabling and disabling a feature are next to each other.

Glenn Foster
Murray, KY

Easy Script and daisywheels—Commodore's DPS-1101, like most daisywheel printers, responds to different control characters than the dot-matrix printers. Because of this, Easy Script's printer-control codes don't work as published, and the printed character set differs slightly from that on the keyboard.

After reading the printer's instruction manual, I discovered how to control its special features from Easy Script. Most require escape sequences to turn them on and off. An escape sequence consists of the escape character, CHR$(27), followed by one or more other characters. To send Escape from Easy Script, press f1, then the up-arrow key. (It will appear on screen as a reverse-field E.) Then just type the character or characters required by the feature with which you're working. Sometimes they must be shifted—read your manual carefully, then do some creative experimentation.

The DPS-1101 cannot print the left-arrow symbol; it prints a backslash instead. Also, to print left and right curly brackets, use the shifted plus and minus keys, respectively.

Jacob M. Chacko
Staten Island, NY

Easy Script and SEQ files—Easy Script saves its files as uncomplicated SEQ files. This feature makes it easy for you to read non-Easy Script sequential files of many types. Just load the desired file as though it were an Easy Script document, and chances are good you'll be able to read it.

J.T. Todd
Suffolk, VA

Easy Script and listings—If you haven't read the back pages of the Easy Script manual, you are missing out on this otherwise undocumented gem. Basic programs can be saved in Easy Script-readable form with just these commands:

```
LOAD "filename",8
OPEN 8,8,8,"0:newfilename,S,W" : CMD8 : LIST
PRINT#8 : CLOSE 8
```

Of course, you must assign a new name to the file when

it is saved in this way. When you load this file into Easy Script, everything will be in lowercase. To convert it to uppercase, use the {f1}U command, which flips the case of all text characters following the cursor.

This technique introduces some spurious Ready prompts into the file, and it doesn't handle reverse-field characters, such as those used for cursor control. You can fix these flaws by using Easy Script to edit the file.

James A. Lisowski
S. Milwaukee, WI

Easy Script music—On my husband's version of Easy Script, pressing f1 and CTRL 3 causes the computer to play Pomp and Circumstance through the monitor's speaker. My own version of the program, an older one, doesn't have this feature at all. So, if you've heard of the Easy Script/Pomp and Circumstance connection, but can't make it work on your own machine, maybe you have an older version of the program.

Karen Rhodes
Orange Park, FL

PaperClip tip—In the PaperClip word processor, embedded commands are preceded by the check-mark symbol, which is made by pressing the pound-sign key (£). If you want to edit these symbols for purposes of using the files with non-PaperClip activities, you have a problem: In the Search and Replace mode, the pound-sign key produces pound signs, not check marks.

The solution is simple. When searching and replacing, use the shifted @ key to get your check mark.

Thomas F. Trocco
New York, NY

Quick Brown Fox colors—It's not documented, but you can easily change the colors on your screen. From initial startup, press the space bar to get the QBF menu. Before making a selection, press the shifted less-than, greater-than or question-mark keys to get, respectively, red, green and blue characters.

F.A. Frost
Altamonte Springs, FL

33. Computer Room Hints

Cheap desk—When my computer system outgrew my desk, I moved everything (temporarily) to our large dining-room table. There, I could see exactly how much desktop space was needed (in my case, about 36 × 48 inches). I called lumber yards until I found one that would cut a piece of ¾-inch plywood to that size; then I bought the piece for $12.

I varnish-stained the plywood, taped its edges with ¾-inch decorative plastic tape and set it on my formerly too-small desk. Now I have a classy looking desk with ample room for every piece of equipment.

Joseph P. Green
Gays Mills, WI

Junkyard computing—Every GM car contains lengths of plastic wire tubing, split lengthwise and used for harnessing cables. This material is excellent for wrapping the many loose wires coming out of your computer and is readily available in any automobile junkyard. There are two sizes of tubing in most cars; the larger one is best for most applications. I bought 50 cents worth, and the area behind my computer is cleaner and better looking than I thought it ever would be.

Patrick Kiser
Silver Lake, IN

Neater wiring—A solution to your computer room's rat's nest of wires and cables can be found in your local garden shop. Double-sided strips of Velcro intended for use as plant ties can be cut to any length to bundle up those runaway wires. The strips can be easily moved, unwound, loosened, tightened and reused, giving greater flexibility than electrical ties provide.

Donna A. Trefry
Scarborough, ME

Cord control—My computer cords and cables no longer are a mess. I fold them inside discarded toilet tissue rolls.

John Wedding
Corning, NY

Cable dressing—Radio Shack sells several varieties of inexpensive cable ties and hold-downs, which can be used to keep your computer area from looking like a wiring rat's nest. I use the self-sticking, quick-release type, which allows me to remove all my cables when I need to transport my computer. They're much better than the permanent wire staples I formerly used.

Darin Benart
Alta Loma, CA

Ponytail computing—Little girls, and some big ones, use a simple device to hold their ponytails. It's an elastic band with a plastic marble at each end, and it's available wherever barrettes and other such items are sold. I use these devices to bundle my cables and cords, and I find them the ideal solution to the rat's nest problem.

Ken Schultz
Vermilion, OH

Get a watch—Buy a $2 stick-on clock-calendar at your local discount store, and stick it to your computer or monitor. That way, you'll be aware of how much time you spend computing.

Mike H.
Paramount, CA

Disk holder—Office supply stores sell an inexpensive item that is perfect for temporary working storage of computer disks and cartridges. Designed for sorting envelopes or holding telephone messages, it has a plastic base with eight vertical separators, dividing it into seven open-ended compartments. The one I use is a Mighty Sorter, made by W.T. Rogers Company, and it fits very nicely on top of my disk drive.

Using this sorter, I can keep about ten disks and cartridges organized on top of my desk, with no immediate need to return them to their envelopes or storage boxes. It really comes in handy when I'm copying disks or otherwise swapping them in and out of the drive.

Margot Poloka
Sewickley, PA

Cartridge labels—Use embossed tape to label your cartridges for easy visibility when plugged into a cartridge-port extension unit. I tape the top edge with the cartridge name, the block or address it occupies, the bytes free or bytes used and the SYS call, if applicable.

Gary L. Rezeau
Address unknown

Marking your manuals—Have you ever searched through a manual looking for a certain item, only to end up looking through every page in the book? Well, here's a little tip for you.

Go to an office supply store and buy some colored paper clips. Put the blue clips on the pages dealing with sound, red for graphics, yellow for memory maps, and so on. You'll find this to be very helpful.

Brian Cross
Coral Springs, FL

Flip files—If you keep your reference data on 3×5 cards, try keeping your cards in a replacement leaf—the kind used in flip-type picture albums. These pages cost about $1.50 and can hold 20 cards. The cards fit into transparent sleeves that are staggered from top to bottom. This arrangement allows you to label the bottom of each card for easy reference.

Doug Curtis
Waukesha, WI

Recordkeeping hint—I keep track of all my machine language programs in a pocket-sized looseleaf notebook available at most department stores. The pages are 3¾" × 6¾", which is large enough to hold what I need, yet small enough to fit in a corner of my desk drawer. The program name goes on the top line of each sheet, followed by loading information, SYS calls, and so forth. I use both sides of the lined sheets, so I never run out of room. I use masking-tape tabs to divide the book into meaningful sections, and the looseleaf system keeps everything safely together, while enabling me to move pages when necessary.

Since Basic programs can be listed on the screen, with numerous REMs to explain them, I seldom enter one in my book. But for all those unlistable machine language programs, with all their versions, SYS calls and options, I wouldn't be without my little book.

Louis F. Sander
Pittsburgh, PA

Beware of humidifiers—The new ultrasonic humidifiers can be hazardous to your computer's health. Some of the manufacturers are including a small warning that they may deposit harmful mineral films on disks and computer equipment. Unlike other humidifiers, which depend on evaporation and leave the minerals behind in the tank, these new ones physically spray the water—minerals and all—into the air. Distilled or specially filtered water is one solution to the problem.

Tom Grayczyk
Chicago, IL

Hex conversion aid—Radio Shack's #65-990 Programmer's Hexadecimal Calculator has been a wonderful addition to my computer room. It converts hex to decimal and vice versa, more smoothly and with less effort than any unit I've seen. It includes a clock and calendar, so it's useful even when sitting on the desk. At $21.95, it's a worthwhile tool for any programmer.

Oberon King
Staten Island, NY

Batteries excluded—If you're tempted to buy rechargeable ni-cads for all those battery-powered items around the computer room, you might want to think again. While they're great for powering toys, and so on, ni-cads don't hold a charge very long, which makes them a liability in seldom-used items like flashlights. And they have a disturbing tendency to fail completely after a year or so, leaving you with an incomplete set of batteries. Did you ever try to buy *one* AA-size ni-cad?

Louis F. Sander
Pittsburgh, PA

Short-wave computing—Hams and SWLs can find a Commodore User's Net on Saturdays at 1500 Eastern Time on 7.228 MHz, lower sideband. All licensed hams are invited to participate.

Warren Flynn, WB4ZOJ
Temple, GA

School days—Have you tried to teach your parents how to use the computer, only to have them walk away furious? Well, here are some of the do's and don'ts of teaching them.

Don't tell them they're dumb or slow or how fast you learned to use the computer.

Don't expect them to remember long commands. Give them one command at a time.

Don't hog the controls, trying to show off. They know you can use the computer or they wouldn't be there.

Do show them applications they're interested in, like word processing.

Do keep them going if they seem interested in a specific program or concept.

Do be patient with them. You weren't a computer whiz in ten minutes, either.

Use your knowledge wisely.

Nick Luggerio
Kingwood, TX

34. Magazines and Books

Magazine indexes—Some of the most useful information in the computer field is found in the back issues

of magazines. A wonderful tool for finding it is the Microcomputer Index (2464 El Camino Real, Santa Clara, CA 95051; 408-984-1097). It's also available on-line through the Dialog information service (800-227-1927). Many libraries subscribe to this treasure trove of computeriana, and some will search Dialog for you.

The index categorizes articles, programs and reviews from dozens of computer publications, and a typical issue contains over 700 entries.

Once you've determined where a piece was published, ask for it at the library or order the back issue from the publisher. If all else fails, try to get a microfilm, from which a hard copy can easily be made. University Microfilms (300 N. Zeeb Road, Ann Arbor, MI 48106; 800-521-0600) provides this type of service.

Frank Biondi
Pittsburgh, PA

Outside reading—*IEEE Spectrum*, the monthly publication of the Institute of Electrical and Electronics Engineers, is a semi-technical journal of interest to all sorts of electrical engineers. Its March 1985 issue contained a superb ten-page article on the design history of the Commodore 64. It includes, among other things, the real explanation of "sparkle" on the early 64s and tells why the 1541 disk drive is so slow. If you know an IEEE member, ask to see that copy.

Louis F. Sander
Pittsburgh, PA

Page tabs—The write-protect tabs that come in each box of disks make dandy markers for important pages in your reference books. Just fold them in half on the desired pages, letting them stick out a bit, and information will be much easier to find.

Jack Ryan
El Dorado, AR

Magazine work—Every computer magazine has its own system of listing programs, and there's little standardization in the symbols they use for cursor and other special characters. You can make your life easier by copying the "how to type in listings" sections from each of your favorite magazines, then pasting them all onto an 8½- × 11-inch card. If you keep the card close by, you can use it as a handy reference when typing in programs.

Deb Sullivan
Pittsfield, MA

Computerese—In some computer publications, the space character is signified by ␢—a lowercase b with a slash through it. It's easier to see and count than an empty space, and the b is a mnemonic for blank.

Rula Lenska
New York, NY

Magazine hacking—Whenever my magazines arrive, I go through each with a colored marker in hand, usually a translucent yellow one. I circle small items of special interest to me, such as interesting Magic tricks. I scan each article briefly, and if it appears to be of interest, I circle its listing in the Table of Contents. For advertising, I circle items I'm interested in, then put a line through their listings on the advertiser's page in the back. I also circle the number on the page of the ad itself so it stands out when I flip through. Later, I make up a card file on articles, and so on. When my disk drive operates properly, I will set up disk files to replace the cards.

D.G. Munoz
Dania, FL

Saving valuable articles—Like most people, I have a large collection of photocopied magazine articles on various computer subjects. One day I arranged them in the order I desired and had them bound at a local print shop. It cost me $2 to have them placed in a plastic ring binder like that on the Programmer's Reference Guide.

Craig Gibleon
Waterloo, IA

Bookwork—After working with my system for several months, I found myself returning again and again to the same few pages and tables in my computer's reference guide. To make things easier, I copied my most frequently used pages and glued them to different-colored sheets of construction paper. Now I have a series of easy-to-find color-coded reference cards with all the sprite information, ASCII codes and other functional charts as needed. What a time saver it has been for me!

Mrs. Ruth A. Hicks
Oak Run, CA

Take notes—Whenever I see an article that mentions a new Poke or Peek, I write it in my memory map book for future reference.

Also, whenever I use a memory location listed in the memory map, I highlight that location in the book. It's surprising how often I need that location again, and the highlighting makes it easy to find.

Don Griffin
Los Angeles, CA

C-64 User's Manual error—In Appendix F (ASCII and CHR$ codes), codes 149–155 are wrong. They should be: brown (149), lt. red (150), grey 1 (151), grey 2 (152), lt. green (153), lt. blue (154) and grey 3 (155).

Ernesto Andrade
San Diego, CA

C-64 User's Manual error #2—If you couldn't get Michael to row the boat ashore when you tried to run the sound program on p. 88, it might be due to a typo that appeared in some versions. Line 60 should read as follows:

```
60 POKE HF,H : POKE LF,L : POKE W,65
```

Wally Morris
Science Hill, KY

Magic Index

Computer-Specific Tricks

1. Computers—C-64

DOS wedge command summary 36
DOS wedge improver 36
DOS wedge loader.....38
DOS wedge reactivation 38
DOS wedge directory freezer 38
DOS wedge volume identifier 38
DOS wedge commands in programs 38
Drive not ready 38
Reset buttons 38
Safer reset switch.....40
Resets on newer C-64's 40
C-64 warm/cold starts 40
Reset tip 40
Pokepourri.....40
Easy RUN 42
No-RUN fix 42
C-64 uncrasher.....42
Calculated Goto command.....42
Program executable List 42
Simplest trace 42
Error messages.....42
Closing files 42
ROMwriter 42
False autostart 44
Program password.....44
C-64 cursor tricks 44
Screen gem.....44
Split screen 44
COL to the colors 44
Screen reverser 92
Supersound 92
Beeper 92
Line bell 92
Basic UNNEW for the C-64 92
Emergency UNNEW 94
Filename finder 94
Autostart programs for the C-64 94
C-64 List freezer 94
Compatible color RAM.....94

2. Computers—C-128

C-64 to C-128 conversions 95
C-128 monochrome monitor 95
40/80 display switching 95
C-128 display width Peek 95
Easy program load.....95
Safe and easy scratches 95
Non-destructive reset.....95
F-keys for data 95
Hexadecimal keypad 97
Sprite shower 97
Spritestorm 97
Sprites and function keys 97
Sprite insurance 97
SPRDEF in Program mode.....97
Exiting Quote mode 97
More to print.....97
PRINT@ in disguise 97
Doodle and the 128.....97
C-128 sound box 97
Multi-voice bug avoidance 98
Using C-64 utilities 98
Renumber bug.....98

3. Computers—Plus/4 and C-16

Plus/4 and C-16 organ 98
Plus/4 and C-16 Super Palette 98
Plus/4 word processor tip 98
Plus/4 tab clear.....98
Plus/4 and C-16 easy saves 98
Plus/4 slow lister 100
Plus/4 and C-16 tips.....100
C-16 tips 100
Plus/4 and C-16 graphics.....100
Plus/4 and C-16 screen titles.....100
Plus/4 screen Pokes 100
Plus/4 calculated Goto.....100

4. Computers—SX-64

SX-64 screen magnifier.....100
SX-64 video modulator 100
SX-64 TV display.....100
SX-64 printer interface 102
SX-64 printer interface #2 102
SX-64 disk tip.....102
SX-64 dual drives.....102

5. Computers—VIC-20

VIC survival kit 102
New life for the VIC 102
VIC extra memory.....102
VIC Super Expander disable 102
VIC Super Expander disable #2 ...104

Hardware Tricks

6. Connectors and Cabling

Connector overview 104
DIN defined 104
DIN connectors 104
Power supply connector 104
Serial bus extenders 104
User port connector 105
Connector protector 105
Edge connector protector.....105
Disaster prevention 105
Making connections 105

7. Datassette Recording

Tape care tip 105
Timesaving saves 105
Loading from tape 105
Selective load and run on tape 105
Datassette audio.....106
Finding files on tape.....106
Cassette directory 106
Finding load addresses 106
Direct tape reading.....106
Tape counter trickery.....106
Controlling tape errors.....106
Bad cassette fix 106
Tape jam cure 106
Loading problem cassettes 106
Better power takeoff 106

8. Disk Directories

Selective directories 107
Multi-selective directory 107
Harmless disk directory 107
Directory trouble.....107
Directory printer 107
Printed disk directories 107
Directories on non-CBM printers 107
Disk names 108
Disk names #2 108
Disk names #3 108
Disk names #4 108
Disk names #5 108

Renaming disks 108
Naming programs 108
Shifted spaces in filenames 108
Easy load filenames 108
Encrypted filenames 109
Program load lock 109
Comma files on disk 109

9. Disk Handling and Storage

Disk-handling tip 109
Magnetic fields 109
Dry disk storage 109
But not too dry 109
Disk carrier 109
Disk archives 109
Disk labels 109
Disk labels #2 109
Disk labels #3 110
Disk labels #4 110
Disk labels #5 110
Disk labels #6 110
Inexpensive disk mailers 110
Disk mailer 110

10. Disk Operations

Disk load and run 110
Loading "*" 110
Estimating program lines 110
Disk copying tip 110
Disk save command quirks 110
Appending to files 110
Commodore 1571 caveat 111
2040/4040 disk drives 111
Disk error light 111
Disk hang-up fix 111
Disk doctor 111

11. Hardware—General Hints & Tips

Equipment turn-on sequence 111
Travel tips 111
Burning in 111
Contact cleaning 112
Keyboard maintenance 112

12. Joystick Port Peripherals

Non-Commodore joysticks 112
Joystick identifiers 112
Fix stix 112
Cable repairs 112
Fire-button fix 112
Left-handed joystick 112
Which port? 112
Reading the joystick 112
Paddle improvements 113
Better paddle Peeking 113
KoalaPad tip 113
KoalaPad programming 113
KoalaPad buttons 113
Lazy light pens 113
Light pen checkout 113

13. Keyboards and Keyboarding

Read the key labels 113
Special keys 113
Touch assistance 113
Keyboard overlays 114
Better overlays 114
Basic abbreviations 114
Direct mode colons 114
Type it anywhere 114
Editing in color 114
Quote mode 114
Disaster relief 114
Reclaiming erased programs 114
Combining two lines 115
Escape literature 115
Generating CTRL characters 115
CTRL character tips 115
Program indentation 115
Vanishing variables 116
Easy RUN 116
Easier RUN 116
Easiest RUN 116
RUNDY 116
Reset curiosity 116

14. Modems and Telecommunications

Telecommunications library 116
Reliability aid 116
Phoneless modem 116
Easy modem upgrade 116
Multi-line modem 117
Don't auto-dial 117
Modem intercom 117
Modem intercom revisited 117
Dummy modem 117
Call waiting 117
More on call waiting 117
Cheap terminal program 117
Better translation tables 117

15. Power Supplies

Hot power supplies 118
Spike protection simplified 118
On overheating 118
Heat sinks 118
Fuses 118
Power supply repairs 118
Power supply repairs #2 118
Dead Datassette 119

16. Printer Paper And Ribbons

Easier paper loading 119
Easier paper loading #2 119
Using plain paper 119
Thermal paper 119
Single-sheet printing tips 119
Printing on envelopes 119
Making envelopes 119
Printing stencils 119
Making spirit masters 119
Two-up labels 120
Pin-feed prestidigitation 120
Paper saver 120
Tractor-feed fodder 120
Visible perforations 120
Paper alarm 120
Ribbon replacements 120
Ribbon re-inking 120
Ribbon rejuvenation 120

17. Printers and Printing

Printer stands 120
Space saver 120
1520 plotter supplies 121
Plotter as printer 121
1520 disk directories 121
Servicing the 1520 plotter 121
1525/MPS-801 paper alignment 121
1525/MPS-801 paper-jam fix 121
1525/MPS-801 carriage return 121
1525/MPS-801 underlining 121
1525/MPS-801 and labels 121
1526/MPS-802 secrets 122
1526/MPS-802 underlining 122
1526/MPS-802 print sizes 122
1526/MPS-802 listings 122
PaperClip and the DPS-1101 122
Okimate programs 122
Paper for the Okimate 10 122
Paper for the Okimate 10 #2 123
Easy Script Oki-magic 123
Olivetti PR2300 ink 123
Olivetti PR2300 ink #2 123
Printer special features 123
Printer cable hang-up 123
Printer lockup fix 123

18. Video and Audio Devices

Eyesaver 123
Glaring nerdhood 123
Soap opera computing 123
Tip for teachers 123
Commodore and the VCR 123
Screen layout aids 124
Video audio 124
Monitor cables 124
TV set switches 124
Video monitor tips 124
Wavy video 124
Computer/TV interference 124
Ground your switchbox 124
Toroid love story 124
Foiling interference 124
For high-quality monitors only 124

Software Tricks

19. Entering Programs

Saving keystrokes 125
Audiovisual typing 125
Typing in programs 125
Blow it up 125
Musical stitchery typing tip 125
Magazine magnifier 125
Placekeeping tip 125
Placekeeping tip #2 125
Placekeeping tip #3 125
Placekeeping tip #4 125
Placekeeping tip #5 125
Typing Data statements 125
Easydata 125
Computer-assisted proofreading . . . 126
Proofreading tip 126

20. Languages—Basic

Keyword tokens 126
CLR clarified 126
Data statement bug 126
DEF FN wizardry 126
Defining variables 127
For . . . Next statements 127
Better For . . . Next delay loops 127
GET this straight! 127
Simple cursor for GET 127
GET# improved 127
Calculated GOTO 127
If . . . Then . . . Else 128
No-question-mark Input 128
Input with default 128
Easy Input filter 128
Improving on INT 128
Loading overlays 128
Load in Program mode 128
Loading machine language 128
MID$ documentation error 129
Open command glitch 129
Printing quotes 129
Printing quotes #2 129
Printing the bottom line 129
Shifted REMs 129
Uses for REMs 129
C-64 selective Restore 129
Random numbers 129
STOP and CONT 129
Tab magic 130
Verifying machine language 130
WAIT for keypresses 130
WAIT for special keys 130

21. Languages—Machine Language

Machine language definitions 130
Machine language lesson 130
Machine language memory locations 130
Machine language in tape buffer . . . 131
Magic ML poker 131
Machine language saves 131
Loading the registers 131
Waiting for shift 132

22. Languages—Other

Comal sprites 132
Logo tips 132
Logo program 132
Logo tool 132
Logo autostart 132

23. Programming Tips—Debugging

Tips for beginners 133
Error finder 133
Test it 133
Follow the cursor 133
Use Stop 133
Crowder probe 133
Data debugging 133
Check the checksum 133
Debugging tip 133
Examining arrays 134
Debugging hint 134
Line tack 134
Line feed fix 134
Tough to see 134

24. Programming Tips—General

Automatic line numbering 134
Program subsets 134
Programming trick 134
Easy GO testing 135
Programming tip 135
Dynamic keyboard explained 135
Programmable Run key 135
Using illegal direct keywords 135
Why disable run/stop? 135
Timekeeper 135
Time format 136
Program delays 136
Named subroutines 136
Deek 136
Lost variables 136
Protected variables 136
Redimensioning arrays 136
Detecting peripherals 136
Terminating games 136

25. Programming Tips—Mathematical

Normal distribution 137
Speedy execution 137
Toggling 137
To float or not to float 137
Random numbers, all different 137
Decimal flags 137
Binary flags 137

26. Programming Tips—Screen Display

Improved reverse characters 138
Quote mode tip 138
Tricky screen formatting 138
Centered printing 138
Vertical tabbing 138
PRINT# to the screen 138
Screen layout aid 138
Graphics memory map 138
Sprite troubles 139
Magic flasher 139
Fade in, fade out 139
Answer screen 139
Customized Ready prompt 139
Customized and optimized 140

27. Programming Tips—Sound

Froggy 140
Drum sounds 140
Easier ADSR 140
Instrument Pokes 140
Speech synthesis 140

28. Programs—Amusements & Delights

Special effect 140
Special effect improved 140
Magic color change 140
Character codes 141
Klawretaw 141
Scintillating screenwork 141
Summertime sounds 141
Rick-rack 141
Flagrant chauvinism 141
Designs! 141
PET Emulator 142
ESP program 142
Fortune cookie 142
Sui generis 143
My valentine 143
April Fool's program 143
Halloween disk devilment 143
Magic sprite demonstrator 143
That which flies 144
That which flies not 144
Season's spritings 144
12-day calculator 144
Word tricks 144
Word tricks #2 145
Word tricks #3 145

Word tricks #4 145
Bad spelling 145
Word trick game 145

29. Programs—Commercial Software

Making tables 146
Address books 146
Database Deluxe improved 146
Doodle files from Print Shop 146
Print Shop files from Doodle 146
Koala files from Print Shop 146
Disabling Epyx Fast Load 146
Fast Load re-enable 146
Ghostbusters buster 146
Ghostfreezers 146
Jumpman jiminy 146
Jumpman jiminy revisited 146
Making Simon simpler 147
Disk backup improvement 147
Star Trek tip 147
Star Wars trickery 147
Wolfenzauberei 147

30. Programs—Useful Applications

Loan payments 147
Day of week routine 147
Days between dates 147
Jumbles 148
Pushup timer 148
Thermometer 148
Printing practice 148

31. Programs—Utilities

Automatic UNNEW 149
Load address finder 149
End address finder 149
Automatic appender 149
Trace utility 149
Memory Scope 150
Screen Poke finder 150
Sort subroutine 151
Disk de-banger 151
Disk ID changers 152
Write-protect detector 152
Sequential file reader 152

32. Word Processing

Magic word processor 152
Automatic setups 153
Printer setup tip 153
DIP switch tip 153
Setup files 153
Text centering tip 153
Indenting outlines 153
Word processor glossary 153
Wordpro parentheses 153
Address files 154
Easy Script tip 154
Easy Script directories 154
Easy Script and interfaces 154
Easy Script and printer codes 154
Easy Script and daisywheels 154
Easy Script and SEQ files 154
Easy Script and listings 154
Easy Script music 155
PaperClip tip 155
Quick Brown Fox colors 155

Miscellaneous Tricks

33. Computer Room Hints

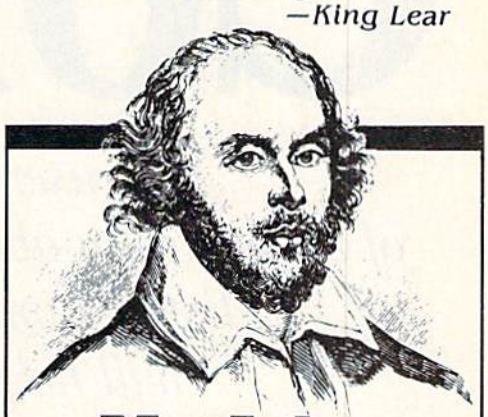
Cheap desk 155
Junkyard computing 155
Neater wiring 155
Cord control 155
Cable dressing 155
Ponytail computing 155
Get a watch 155
Disk holder 155
Cartridge labels 156
Marking your manuals 156
Flip files 156
Recordkeeping hint 156
Beware of humidifiers 156
Hex conversion aid 156
Batteries excluded 156
Short-wave computing 156
School days 156

34. Magazines and Books

Magazine indexes 156
Outside reading 157
Magazine storage 157
Page tabs 157
Find those articles 157
Magazine work 157
Computerese 157
Magazine hacking 157
Saving valuable articles 157
Bookwork 157
Take notes 157
C-64 User's Manual error 157
C-64 User's Manual error #2 157

Circle 443 on Reader Service card.

At Christmas I no more desire a rose
Than wish a snow in May's new fangled mirth
But like of each thing that in season grows
—King Lear



MacInker

A Gift For Christmas
A Gift For All Seasons

If Shakespeare had had a word processor, he would have consumed about 25 cartridges to run a first draft of his works. At an average cost of $10/cartridge, the cost is $250. With MAC INKER he would use one cartridge, his total would be 50 cents in ink, and his print-out quality would be much improved.

And now one UNIVERSAL CARTRIDGE MAC INKER (UC) re-inks all fabric cartridges and one UNIVERSAL SPOOL MAC INKER (US) re-inks all spools. MAC INKER (UC) is $60. Cartridge drivers are $8.50 ea. MAC INKER (US) is $66.95. We still have our first generation, dedicated MAC INKER(s) for most popular printers, with prices starting at $54.95. You can also use any MAC INKER to create and/or re-ink your own colored cartridges. There are more than 45,000 MAC INKERS in the field in the U.S. and overseas. MAC INKER has been reviewed, approved and flattered in most magazines, and even in the *New York Times* and the *Chicago Sun Times*.

Universal Cartridge Mac Inker

Order toll free 1-800-547-3303
or ask for free brochure

Computer Friends

6415 SW Canyon Court, Suite #10
Portland, OR 97221
in Oregon and for 24-hour service
(503) 297-2321 • Telex 4949559CF

Commod

A user's group can be a rich source of information about your computer. This comprehensive list of Commodore clubs and user's groups will help you find the one nearest you.

Alabama

VALLEY COMMODORE USER'S GROUP
915 WAY THRU THE WOODS SW
DECATUR, AL 35603
205-355-4005
DAVID NELSON

HUNTSVILLE AL COMMODORE COMPUTER SOCIETY
PO BOX 14356
HUNTSVILLE, AL 35815

COMMODORE CLUB OF MOBILE
3868-H RUE MAISON
MOBILE, AL 36608
205-343-1178

TIGER BYTE ALABAMA CBM 64
MIDWAY PLAZA
OPELIKA, AL 36801

SHOALS COMMODORE USER'S GROUP
209 LAKESHORE DRIVE
MUSCLE SHOALS, AL 35661

COMMODORE CLUB SOUTH
PO BOX 324
PINSON, AL 35126
BILL FREEMAN

RIVERCHASE COMMODORE USER'S GROUP
617 GROVE ST.
BIRMINGHAM, AL 35209
205-988-1078

HUNTSVILLE PET USER'S CLUB
9002 BERCLAIR ROAD
HUNTSVILLE, AL 35802

WIREGRASS MICROCOMPUTER SOCIETY
109 KEY BENT ROAD
ENTERPRISE, AL 36330
205-347-7564

Alaska

SITKA COMMODORE USER'S GROUP
PO BOX 2204
SITKA, AK 99835
907-966-2275
DENNIS LANHAM

FIRST CITY USER'S GROUP
BOX 6002
KETCHIKAN, AK 99901
JAMES LLANOS

ALASKA 64 COMPUTER CLUB
PO BOX 6043
ANCHORAGE, AK 99502

COMPOOH-T
BOX 118
OLD HARBOR, AK 99643
907-286-2213

ANCHORAGE COMMODORE USER'S GROUP
PO BOX 104615
ANCHORAGE, AK 99510
907-753-4218
DAVID ROWE

Arizona

THUNDER MTN. COMMODORE USER'S GROUP
PO BOX 1796
SIERRA VISTA, AZ 85636

PRESCOTT AREA COMMODORE CLUB
PO BOX 26532
PRESCOTT VALLEY, AZ 86312

COMMODORE USER'S GROUP OF ARIZONA
933 S. ACORN
TEMPE, AZ 85281
602-962-4074
MARGARETE HERR

ARIZONA VIC/64 USER'S CLUB
PO BOX 27201
TEMPE, AZ 85282
NANCY GOODMAN

WEST MESA VIC
2351 S. STANDAGE
MESA, AZ 85202

VIC USER'S GROUP
2612 E. COVINA
MESA, AZ 85203

CENTRAL ARIZONA PET PEOPLE
842 W. CALLE DEL NORTE
CHANDLER, AZ 85224

CATALINA COMMODORE COMPUTER CLUB
201 AVENIDA GUILLZERMO
TUCSON, AZ 85710

COMMODORE USER GROUP
4500 E. SPEEDWAY
SUITE 13
TUCSON, AZ 85712
METRO COMPUTER STORE

FOUR CORNERS USER'S GROUP
BOX 1945
CHINLE, AZ 86503
602-674-3421
CANY DE CHELLY

Arkansas

SO. WEST ARKANSAS COMMODORE USER GROUP
404 S. GREENING ST.
HOPE, AR 71801
501-777-8043

VIC CLUB
BOX 130
HATFIELD, AR 71945
501-389-6161
HATFIELD PUBLIC SCHOOL

COMMODORE PET USER'S CLUB
CONWAY MIDDLE SCHOOL
DAVIS ST.
CONWAY, AR 72032

SILOAM COMMODORE COMPUTER CLUB
PO BOX 88
SILOAM SPRINGS, AR 72761
501-524-5624

ARKANSAS RIVER VALLEY COMMODORE USERS
401 S. ARLINGTON DRIVE
RUSSELLVILLE, AR 72801
501-967-1868

BOONEVILLE 64 CLUB
401 W. 5TH ST.
BOONEVILLE, AR 72927

COMMODORE COMPUTER CLUB
PO BOX 6000 SOUTH STATION
FT. SMITH, AR 72906

RIVER CITY COMMODORE CLUB
PO BOX 4298
NORTH LITTLE ROCK, AR 72116
GARY SMITH

California

20/64 GROUP
2170 W. BROADWAY #529
ANAHEIM, CA 92804
CRAIG BARNES

CIVIC64 USER GROUP
PO BOX 2442
OXNARD, CA 93034
805-985-8150

ore Clubs

NAPA VALLEY COMMODORE COMPUTER CLUB
PO BOX 2324
NAPA, CA 94558

PLUS/4 USER'S GROUP
PO BOX 1001
MONTEREY, CA 93940

MONTEREY PENINSULA COMMODORE GROUP
PO BOX 2105
SEASIDE, CA 93955
408-649-8236
RICHARD BOLSTER

LIBRASCOPE COMPUTER CLUB
833 SONORA AVE.
GLENDALE, CA 91201
GEORGE WEBB

64 KOMMANDORES
319 WEST BROADWAY (CITY EMP. BLDG.)
LONG BEACH, CA 90802
213-435-6136
GRACE KIRKHAM

FORTH INTEREST GROUP
PO BOX 8231
SAN JOSE, CA 95155
415-962-8603

FRESNO 64 USER'S GROUP
689 WEST SANTA ANA #102
CLOVIS, CA 93612
GREG EDWARDS

COMMODORE 64 CLUB
1804 N. DUNDEE
HIGHLAND, CA 92346
714-864-4498
CARL GARDENAS

PASADENA COMMODORE COMPUTER CLUB
PO BOX 1163
ARCADIA, CA 91006
818-904-0607
ERNIE MCDONALD

COMMODORE OWNERS OF PETALUMA
877 GRANT AVE.
PETALUMA, CA 94952
707-762-8398
DAVE STROUD

HUMBOLDT COMMODORE USER'S GROUP
PO BOX 6502
EUREKA, CA 95501
DONALD OREMUS

SUCCESS
301 VERONICA DRIVE
PASO ROBLES, CA 93446
805-238-6294
WAYNE WEICHEL

FRESNO COMMODORE USER'S GROUP
991 WEST 9TH #203
CLOVIS, CA 93612
GREG EDWARDS

AUBURN COMMODORE COMPUTER CLUB
337 RACETRACK ST.
AUBURN, CA 95603
DAN WOJDAC

SAN DIEGO COMMODORE (PET) USER GROUP
BOX 86531
SAN DIEGO, CA 92138
619-277-7214
JANE CAMPBELL

SAN LUIS OBISPO COMMODORE CLUB
1766 9TH ST.
LOS OSOS, CA 93402
805-528-3371
JOAN RINEHART

NO. AMERICAN PROGRAM EXCH. USER GROUP 64
3820 BRAVE AVE.
BAKERSFIELD, CA 93309

CAL POLY COMMODORE USER'S GROUP
14617 ½ ROMONA BLVD.
BALDWIN PARK, CA 91706
818-960-9906
DAVID DIETZEL

COMMODORE 64 WEST USER'S GROUP
PO BOX 406
SANTA MONICA, CA 90406
213-828-9308

ABACUS
PO BOX 3415
BAKERSFIELD, CA 93385
GENE SMITH

COMMODORE USER GROUP OF SANTA CRUZ
PO BOX 8068
SANTA CRUZ, CA 95061
408-335-2082

VIC-TORIE
PSC #1, BOX 23467
APO SAN FRANCISCO, CA 96230

VIC SOFTWARE EXHANGE
10530 SKY CIRCLE
GRASS VALLEY, CA 95945

VACUUM
277 EAST 10TH AVE.
CHICO, CA 95926
916-891-8085

SACRAMENTO COMMODORE USER'S GROUP
8120 SUNDANCE DRIVE
ORANGEVILLE, CA 95662
916-969-2028

AMATEURS & ARTESIANS COMPUTING
PO BOX 682
COBB, CA 95426

SANTA ROSA COMMODORE 64 USER'S GROUP
333 EAST ROBLES AVE.
SANTA ROSA, CA 95407
707-584-7009

LINCOLN COMPUTER CLUB
750 E. YOSEMITE
MANTECA, CA 95336

MANTECA VIC USER'S ORGANIZATION
429 N. MAIN ST.
MANTECA, CA 95336

20/64
PO BOX 18473
SAN JOSE, CA 95158
408-978-0546

SOUTH BAY COMMODORE 64 USER'S GROUP
PO BOX 3193
SAN YSINDRO, CA 95073

PUG OF SILICON VALLEY
22355 RANCHO VENTURA ROAD
CUPERTINO, CA 95014

LOGIKS COMMODORE COMPUTER CLUB
620 DEL GANADO ROAD
SAN RAFAEL, CA 94903
415-479-0426

BAY AREA COMPUTER ASSOCIATION
1332 PINE ST.
WALNUT CREEK, CA 94598
415-932-5447

WALNUT CREEK PET USER'S CLUB
1815 YGNACIO VALLEY ROAD
WALNUT CREEK, CA 94596

PALS LIVERMORE SOCIETY
886 SOUTH K
LIVERMORE, CA 94550

FAIRFIELD VIC CLUB
1336 MCKINLEY ST.
FAIRFIELD, CA 94533
707-427-0143

SPHINX
22091 YOUNG AVE.
CASTRO VALLEY, CA 94546
415-527-9286

DIABLO VALLEY COMMODORE USER GROUP
762 RUTH DRIVE
PLEASANT HILL, CA 94523
415-671-0145

PET ON AIR
525 CRESTLAKE DRIVE
SAN FRANCISCO, CA 94132

SAN FRANCISCO COMMODORE USER'S GROUP
278 27TH AVE. #103
SAN FRANCISCO, CA 94121
415-387-0225

VIC CLUB OF SAN FRANCISCO
1503A DOLORES
SAN FRANCISCO, CA 94110

PENINSULA COMMODORE USER'S GROUP
549 OLD COUNTY ROAD
SAN CARLOS, CA 94070
415-593-7697

SOFTWARE 64
353 CALIFORNIA DRIVE
BURLINGAME, CA 94010
415-340-7115

COMPUTER BARN COMPUTER CLUB
319 MAIN ST., SUITE 2
SALINAS, CA 93901

SIXTY FOURUM
PO BOX 16098
FRESNO, CA 93755

ANTELOPE VALLEY COMMODORE USER GROUP
PO BOX 4436
LANCASTER, CA 93539
805-942-2626

COMMODORE USER'S CLUB
1041 FOXENWOODS DRIVE
SANTA MARIA, CA 93455

C-64 WEST ORANGE COUNTY USER'S GROUP
PO BOX 1457
HUNTINGTON BEACH, CA 92647
714-842-4484

C-TUG ORANGE COUNTY
PO BOX 8051
ORANGE, CA 92664

JURUPA WIZARDS
8700 GALENA ST.
RIVERSIDE, CA 92509

COMMODORE INTEREST ASSOCIATION
14660 LA PAZ DRIVE
VICTORVILLE, CA 92392
C/O COMPUTER DATA

SAN DIEGO EAST COUNTY 64 USER GROUP
6353 LAKE APOPKA PLACE
SAN DIEGO, CA 92119
619-698-7814

SOUTHERN CAL EDISON COMMODORE CLUB
PO BOX 800
ROSEMEAD, CA 91770

DIAMOND BAR ROP USER'S CLUB
2644 AMELGADO
HACIENDA HEIGHTS, CA 91745
213-333-2645

CA AREA COMMODORE TERMINAL USER SOCIETY
PO BOX 1277
ALTA LOMA, CA 91701

VALLEY COMPUTER CLUB
2006 MAGNOLIA BLVD.
BURBANK, CA 91506

SAN FERNANDO VALLEY COMMODORE USER GROUP
1120 WHITECLIFF ROAD
THOUSAND OAKS, CA 91360

SIG
1135 CORONET AVE.
PASADENA, CA 91107

THE EXCHANGE
PO BOX 9189
LONG BEACH, CA 90810
213-595-1771

VIC SOFTWARE EXCHANGE
7660 WESTERN AVE.
BUENA PARK, CA 90620

SOUTH BAY COMMODORE USER'S GROUP
1402 W. 218TH ST.
TORRANCE, CA 90501

SOUTHERN CALIFORNIA PET USER'S GROUP
8315 FIRESTONE BLVD.
DOWNEY, CA 90241
213-923-9361

VIC USER'S GROUP
2791 MCBRIDE LANE #121
SANTA ROSA, CA 95401

Colorado

FT. COLLINS C3
1625 CENTENNIAL ROAD
FT. COLLINS, CO 80525
JUDY DIFRANCESCO

VICDORE USER'S GROUP
326 EMERY DRIVE
LONGMONT, CO 80501
303-772-2821

COLORADO COMMODORE CLUB
2187 S. GOLDEN COURT
DENVER, CO 80227

VICKIMPET USER'S GROUP
4 WARING LANE
GREENWOOD VILLAGE
LITTLETON, CO 80121

COMMODORE USER'S GROUP
BOX 377
ASPEN, CO 81612
308-925-5604

AURORA MARKET USER'S GROUP
15200 E. 6TH AVE.
AURORA, CO 80011
303-367-0901
ROGER OBERDIER

COLORADO COMMODORE COMPUTER CLUB
64 MOUNTAIN SHADOWS LANE
CASTLE ROCK, CO 80104
303-688-9104
RAL SANDBERG

UNCOMPAHGRE VALLEY COMMODORE USER'S GROUP
PO BOX 1324
MONTROSE, CO 81402

Connecticut

CAPITAL R COMPUTER CLUB
48 DOGWOOD ROAD
TOLLAND, CT 06084

JOHN GARBARINO
SKIFF LANE
MASONS ISLAND
MYSTIC, CT 06355

THE COMMODORE EAST USER'S GROUP
165 B SOUTH BIGELOW ROAD
HAMPTON, CT 06247
203-455-0108

COMMODORE USER CLUB
411 WOLCOTT HILL ROAD
WETHERSFIELD, CT 06109

WETHERSFIELD HIGH SCHOOL VIC USER'S CLUB
22 TUNIS ROAD
WEST HARTFORD, CT 06107

CONNECTICUT COMPUTER SOCIETY
180 BLOOMFIELD AVE.
HARTFORD, CT 06105
203-233-3373

CAPITAL REGION COMMODORE COMPUTER CLUB
57 CARTER DRIVE
TOLLAND, CT 06084

NEW LONDON COUNTY COMMODORE CLUB
DOOLITTLE ROAD
PRESTON, CT 06360

FAIRFIELD COUNTY COMMODORE USER GROUP
PO BOX 212
DANBURY, CT 06810

COMMODORE 64 USER GROUP OF STRATFORD
PO BOX 1213
STRATFORD, CT 06497
203-377-8373

MUG-64
NNECO TRAINING BLDG.
PO BOX 128
WATERFORD, CT 06385
203-444-4831
TOM HARVEY

STAMFORD COMMODORE USER'S GROUP
PO BOX 1337
STAMFORD, CT 06904

Delaware

LOWER DELAWARE COMMODORE COMPUTER CLUB
PO BOX 882
REHOBOTH BEACH, DE 19971

FIRST STATE COMMODORE CLUB
PO BOX 1313
DOVER, DE 19903
SUSAN TRUITT

DIAMOND STATE USER'S GROUP
BOX 892, RD #2
FELTON, DE 19943
302-284-4495

TRI-STATE USER'S GROUP
2312 CARPENTER ROAD
WILMINGTON, DE 19810

NEWARK COMMODORE USER'S GROUP
210 DURSO DRIVE
NEWARK, DE 19711
302-737-4686

District of Columbia

USO CLUB
207 BEYER ROAD
SW-USO OUTREACH CENTER
WASHINGTON, DC 20332

Florida

SUN COAST 64S
PO BOX 6628
OZONA, FL 34265
BOB DEILEY

LAKELAND VIC USER'S GROUP
2450 SHADY ACRES DRIVE
MULBERRY, FL 33319

MANASOTA COMMODORE USER'S GROUP
916 EAST 35TH AVENUE DRIVE
BRADENTON, FL 33508
813-747-1784
BOB BRONSON

MIAMI 20/64
12911 SW 49TH ST.
MIAMI, FL 33175
305-226-1185

64 EDUCATOR'S USER'S GROUP SOUTH
9220 SW 52ND TERRACE
MIAMI, FL 33165
305-274-3501

THE ULTIMATE 64 EXPERIENCE
5740 SW 56TH TERRACE
MIAMI, FL 33143

SOUTH FLORIDA PET USER'S GROUP
7170 SW 11TH
WEST HOLLYWOOD, FL 33023
305-987-6982

EL SHIFT OH
PO BOX 548
COCOA, FL 32922

COMMODORE USER'S GROUP
545 E. PARK AVE., APT. 2
TALLAHASSEE, FL 32301
904-224-6282

COMMODORE COMPUTER CLUB
PO BOX 60514
JACKSONVILLE, FL 32236
DWAYNE MAYS

SUN COAST VICS
PO BOX 1042
INDIAN ROCKS BEACH, FL 33535

64 USER'S GROUP
PO BOX 561689
MIAMI, FL 33156

RICHARD PRISTIEN
6278 SW 14TH ST.
MIAMI, FL 33144

PETS AND FRIENDS
129 NE 44TH ST.
MIAMI, FL 33137

COMMODORE 64/VIC USER GROUP
PO BOX 5837, MP 142
ORLANDO, FL 32855

GAINESVILLE COMMODORE USERS
3604-20A SW 31ST DRIVE
GAINESVILLE, FL 32608

BAY COMMODORE USER'S GROUP
241 N. TYNDALL PARKWAY
BOX 6215
PANAMA CITY, FL 32401
904-785-6441
GULF COAST COMPUTER EXCHANGE

JACKSONVILLE AREA PET SOCIETY
401 MONUMENT ROAD #177
JACKSONVILLE, FL 32211

COMMODORE BROOKSVILLE USER'S GROUP
PO BOX 1261
BROOKSVILLE, FL 33512
904-799-5292

BRANDON USER'S GROUP
813 VALLEY HILL DRIVE
BRANDON, FL 33511

BROWARD COMMODORE USER'S GROUP
PO BOX 25794
TAMARAC, FL 33320

CITRUS COMMODORE USER'S GROUP
PO BOX 1494
INVERNESS, FL 32651
904-344-2793

THE COMMODORE ADVANTAGE
PO BOX 18490
PENSACOLA, FL 32523
904-456-6554
DEANNA OWENS

RAM ROM 84 COMPUTER USER'S GROUP
PO BOX 1369
ENGLEWOOD, FL 34295

LAKE SUMTER COMMODORE USER'S GROUP
PO BOX 416
LEESBURG, FL 32748

64 SOCIETY
4071 EDGEWATER DRIVE
ORLANDO, FL 32804

CHIPS
UMR BOX 3063
AVON PARK, FL 33825

VIC/64 HEARTLAND USER'S GROUP
1220 BARROW ROAD #23
LAKELAND, FL 33801
813-666-2132

COMMODORE COMPUTER CLUB
PO BOX 21138
ST. PETERSBURG, FL 33742
813-522-2547

TAMPA BAY COMMODORE COMPUTER CLUB
10208 N. 30TH ST.
TAMPA, FL 33612
813-977-0877

CLEARWATER COMMODORE CLUB
PO BOX 11211
CLEARWATER, FL 33518

FT. WALTON BEACH COMMODORE USER GROUP
PO BOX 3
SHALIMAR, FL 32579
904-651-3737
JAMES MOORE

COMMODORE USER'S GROUP OF PENSACOLA
PO BOX 3533
PENSACOLA, FL 32516
904-455-5804
DEBBIE JOHNSTON

PUBLIC DOMAIN USER'S GROUP
PO BOX 1442
ORANGE PARK, FL 32067
WILLIAM ROGERS

COMMODORE USER'S GROUP AT TALLAHASSEE
PO BOX 14015
TALLAHASSEE, FL 32316
DAVE LANG

COMMODORE STUFF
2260 17TH ST.
VERO BEACH, FL 32920
305-562-1645
WADE GUGGINS

Georgia

COMMODORE CRAZE INTERNATIONAL
1284 LYNN DRIVE
WAYCROSS, GA 31501

ATHENS COMMODORE ENTHUSIASTS
130 ST. JAMES DRIVE
ATHENS, GA 30606
404-543-5541
STANTON ROBERTSON

SAVANNAH COMMODORE USER'S GROUP
103 VIRGINIA AVE.
SAVANNAH, GA 31404
912-236-1686
DALE REAGAN

COMMODORE COMPUTER CLUB OF COLUMBUS
6618 FOXDALE DRIVE
COLUMBUS, GA 31907
404-563-0828
NOSH SETHNA

VIC EDUCATOR'S USER'S GROUP
110 ACADEMY ST.
CANTON, GA 30114
CHEROKEE COUNTY SCHOOLS

COMMODORE USER'S GROUP OF ATLANTA
633 CLAIRMONT CIRCLE
DECATUR, GA 30033
404-634-8863

Hawaii

20/64 HAWAII
PO BOX 23260
KAILUA, HI 96822

MAKAI COMMODORE USER GROUP
PO BOX 6381
HONOLULU, HI 96818
808-423-1504

COMMODORE HAWAII USER'S GROUP
PO BOX 61598
HONOLULU, HI 96822

Idaho

POCATELLO COMMODORE USER'S GROUP
82 MOUNTAIN DRIVE
POCATELLO, ID 83204

COMMODORE USER'S GROUP
310 EMERALD DRIVE
KELLOGG, ID 83837
208-784-8751

64 BUG
PO BOX 276
BOISE, ID 83701
208-344-6302

SRHS COMPUTER CLUB
SALMON RIVER HIGH SCHOOL
RIGGINS, ID 83549

GHS COMPUTER CLUB
910 SOUTH D ST.
GRANGEVILLE, ID 83530
GRANGEVILLE HIGH SCHOOL

EAGLE ROCK COMMODORE USER'S GROUP
900 S. EMERSON
IDAHO FALLS, ID 83401

COMMODORE USERS
548 E. CENTER
POCATELLO, ID 83201

COMMODORE-COEUR D'ALENE COMPUTER CLUB
506 LUNCEFORD LANE
COEUR D'ALENE, ID 83814
208-765-3803

USER'S GROUP OF LOWER IDAHO
RT. 4, BOX 67
RUPERT, ID 83350
208-436-4283

COMMODORE CORPS OF COEUR D'ALENE
PO BOX 007
HARRISON, ID 83833
208-689-3919
TOM NELSON

CARIBOU COMMODORE CLUB
PO BOX 535
SODA SPRINGS, ID 83276
208-547-4143

BLACKFOOT USER'S GROUP
417 SOUTH 1200 WEST
PINGREE, ID 83262
CURTIS SMITH

Illinois

SPRINGFIELD PET USER GROUP
3116 CONCORD
SPRINGFIELD, IL 62704
217-753-8500

TRI COUNTY COMMODORE USER'S GROUP
PO BOX 564
ERIE, IL 61250

COMM EDISON EMPLOYEES COMMODORE USER GROUP
6536 W. TERRACE DRIVE
TINLEY PARK, IL 60477
312-429-1169
JOHN MCDOWELL

JACKSONVILLE AREA COMMODORE USER GROUP
PO BOX 135
MURRAYVILLE, IL 62668
217-882-5481
GREG SIMPSON

SO. ILLINOIS COMMODORE USER GROUP
508 WEST COLLINS
GOREVILLE, IL 62939

KANKAKEE HACKERS
RR #1, BOX 279
ST. ANNE, IL 60964
815-933-4407

COMMODORE 64 USER'S CLUB
104 SUSAN LANE
CARTERVILLE, IL 62918
618-985-4710

MT. VERNON COMMODORE USERS
PO BOX 512
MT. VERNON, IL 62864

WIPUG
RT. 5, BOX 75
QUINCY, IL 62301
217-656-3671

PEORIA AREA PET USER'S GROUP
6 APPLE TREE LANE
EAST PEORIA, IL 61611
309-673-6635

ILLINOIS VALLEY COMMODORE USER GROUP
2330 12TH ST.
PERU, IL 61354
815-223-5141

COMCOE
2108 SHERMAN AVE.
EVANSTON, IL 60201

VIC/64 USER'S SUPPORT
114 S. CLARK ST.
PANA, IL 62557
217-562-4568

CENTRAL ILLINOIS PET USERS
635 MAPLE
MT. ZION, IL 62549
217-864-5320

COMMODORE USER'S CLUB
1707 EAST MAIN ST.
OLNEY, IL 62450

ASM/TED USER GROUP
200 S. CENTURY
RANTOUL, IL 61866

WESTERN ILLINOIS COMMODORE USER GROUP
906 WEST 6TH AVE.
MONMOUTH, IL 61462
ROBERT COKEL

PEORIA AREA PET USER'S GROUP
800 SW JEFFERSON ST.
PEORIA, IL 61605
309-674-5998

C-64 USER'S GROUP
PO BOX 46464
LINCOLNWOOD, IL 60646
312-588-0334

SCOTT COMMODORE USER'S GROUP
PO BOX 397
SCOTT AFB, IL 62225
618-746-2732
GILBERT HELLAND

FOX VALLEY 64 USER'S GROUP
PO BOX 28
N. AURORA, IL 60542
312-898-2779
FRANK CHRISTENSEN

COMMODORE SIG CACHE
BOX C-176, 323 S. FRANKLIN #804
CHICAGO, IL 60606
312-685-0994
HERB SWANSON

SPRINGFIELD AREA VIC ENTHUSIASTS
PO BOX 2961
SPRINGFIELD, IL 62708
217-522-2706
MIKE STOUT

SURVIVORS OF 64 USER'S GROUP
WESTERN IL UNIV-WESL INSTITUTE
MACOMB, IL 61455
309-837-5378
MACEY MCKEE

MCHENRY COUNTY COMMODORE CLUB
227 EAST TERRA COTTA AVE.
CRYSTAL LAKE, IL 60014
815-455-3942
JOHN KATKUS

ALTON COMMODORE USER'S GROUP
3103 CLAY ST.
ALTON, IL 62002
618-462-7136

SAUK VALLEY COMPUTER CLUB
BOX 702
STERLING, IL 61081

MIDWEST C-64 USER'S GROUP
PO BOX 421
WESTMONT, IL 60559
312-895-4026
PIERRE CALLEROS

GATEWAY COMPUTER CLUB
PO BOX 207
BELLEVILLE, IL 62222
RICH FISHER

CANTON AREA COMMODORE USER'S GROUP
RR #1, SPOON RIVER COLLEGE
CANTON, IL 61520
309-647-4645

ROCKFORD AREA COMMODORE COMPUTER CLUB
2507 PELLERHAM ROAD
ROCKFORD, IL 61107
KATHE HEYER

SHELLY WERNIKOFF
2731 N. MILWAUKEE AVE.
CHICAGO, IL 60647

VIC CHICAGO CLUB
3822 N. BELL AVE.
CHICAGO, IL 60618

CHICAGO COMMODORE 64 USERS
PO BOX 14233
CHICAGO, IL 60614

OAK LAWN COMMODORE USERS
11004 S. CICERO AVE.
OAK LAWN, IL 60453
C/O COMPUTER STORE

EAST SIDE COMPUTER CLUB
3103 CLAY ST.
ALTON, IL 62002
618-462-7136

CHAMPAIGN-URBANA COMMODORE USER GROUP
2006 CRESCENT DRIVE
CHAMPAIGN, IL 61821
217-352-9681

DECATUR COMMODORE COMPUTER CLUB
1368 W. RIVERVIEW
DECATUR, IL 62521
JIM TONIS

Indiana

COMPUTER USERS OF EVANSVILLE
PO BOX 2305
EVANSVILLE, IN 47714
812-476-9107
BRAD CALLAHAN

WESTERN INDIANA COMMODORE USERS
PO BOX 1898
TERRE HAUTE, IN 47808

COMMODORE OWNERS OF LAFAYETTE
PO BOX 5763
LAFAYETTE, IN 47903

COMMODORE 64 USER'S GROUP
912 SOUTH BROWN AVE.
TERRE HAUTE, IN 47803
812-234-5099

SEYMOUR PEEKERS
108 N. CHESTNUT
SEYMOUR, IN 47474
C/O D&L CAMERA SHOP

VIC/64 USER'S GROUP
2401 COLUMBUS AVE.
ANDERSON, IN 46014
317-378-3016

NATIONAL VIC PROGRAM EXCHANGE
102 HICKORY COURT
PORTLAND, IN 47371
219-726-4202

EAST CENTRAL INDIANA VIC USERS
RR #2
PORTLAND, IN 47371

COMMODORE USER'S GROUP
1020 MICHIGAN AVE.
LOGANSPORT, IN 46947

CHUG
12104 MEADOW LANE
OAKLANDON, IN 46236

NO. INDIANA COMMODORE ENTHUSIASTS
927 S. 26TH ST.
SOUTH BEND, IN 46615

NATIONAL SCIENCE CLUBS COMMODORE USERS
PO BOX 10621
MERRILVILLE, IN 46411

COMPUTER WORKSHOP VIC/64
282 SOUTH 600 WEST
HEBRON, IN 46341
219-988-4535

CARDINAL SALES
6225 COFFMAN ROAD
INDIANAPOLIS, IN 46286
317-298-9650

PET/64 USERS
10136 E. 96TH ST.
INDIANAPOLIS, IN 46256

VIC INDY CLUB
PO BOX 11543
INDIANAPOLIS, IN 46201
317-357-6906

TRI-STATE COMMODORE USERS
6500 CENTER RIDGE ROAD
NEWBURGH, IN 47630
812-853-2334
JERRY SCHAUSS

THE COLUMBUS COMMODORE CLUB
2676 LAFAYETTE AVE.
COLUMBUS, IN 47201
WALT HUTTON

COMMODORE COMPUTER CLUB
PO BOX 2332
EVANSVILLE, IN 47714
812-985-9707
JACK MARTIN

Iowa

COMMO-HAWK COMMODORE USER'S GROUP
PO BOX 2724
CEDAR RAPIDS, IA 52406

COMMODORE USER'S GROUP OF CLINTON
PO BOX 743
CLINTON, IA 52732
319-243-2182
TERRY VOSS

COMMODORE COMPUTER USERS OF IOWA
BOX 3140
DES MOINES, IA 50702
515-287-1378

NEWTON COMMODORE USER'S GROUP
320 W. 9TH ST. SOUTH
NEWTON, IA 50208
515-792-0814

PEC COMMODORE USER'S GROUP
333 JOY DRIVE
WATERLOO, IA 50701
AL SORENSEN

COMMODORE USER'S GROUP
965 SECOND ST.
MARION, IA 52302

SIOUXLAND COMMODORE CLUB
2700 SHERIDAN ST.
SIOUX CITY, IA 51104
712-258-7903

COMMODORE USER GROUP
114 8TH ST.
AMES, IA 50010

QUAD CITIES COMMODORE CLUB
PO BOX 3994
DAVENPORT, IA 52808
319-391-3197

CRAWFORD COUNTY COMMODORE USER GROUP
519 N. 19TH ST.
DENISON, IA 51442
712-263-6274
KENNETH HAYDON

Kansas

TOPEKA COMMODORE USER'S GROUP
7939 S. TOPEKA BLVD. #39
WAKARUSA, KS 66546
ROBERT WAYMAN

WALNUT VALLEY COMMODORE USER GROUP
1003 S. SECOND ST.
ARKANSAS CITY, KS 67005

LAWRENCE COMMODORE USER'S GROUP
PO BOX 2204
LAWRENCE, KS 66045

DODGE CITY COMMODORE USER GROUP
14TH & BY PASS 50
DODGE CITY, KS 67801
IRWIN NOYES

WICHITA AREA PET USERS
2231 BULLINNGER
WICHITA, KS 67204
316-838-0518

COMMODORE USER'S GROUP
6050 SOUTH 183RD ST. WEST
VIOLA, KS 67149

KANSAS COMMODORE COMPUTER CLUB
101 S. BURCH
OLATHE, KS 66061

SALT CITY COMMODORE CLUB
PO BOX 2644
HUTCHINSON, KS 67501
JOHN BLEAZARD

Kentucky

LOUISVILLE USERS OF COMMODORE KY
2830 DESHLER DRIVE
LOUISVILLE, KY 40213
502-964-2696
LARRY HIBBS

BOWLING GREEN COMMODORE USER'S GROUP
RT. 11, CREEKSIDE, APT. 6
BOWLING GREEN, KY 42101
502-781-9098

GOLD CITY USER'S GROUP
129 CECILIANNA DRIVE
ELIZABETHTOWN, KY 42701
502-737-9067
PAT WATTERSON

COMMODORE USER'S GROUP OF CENTRAL KY
173 FOREST AVE.
LEXINGTON, KY 40508
JOHN REA

LOGAN COUNTY COMMODORE USER'S CLUB
PO BOX 302
LEWISBURG, KY 42256
502-755-2903
LARRY MCDOWELL

VIC CONNECTION
1010 S. ELM
HENDERSON, KY 42420

C*BUG
PO BOX 165
BARDSTOWN, KY 40004
502-348-6380

Louisiana

LAKE CHARLES 64 USER'S GROUP
PO BOX 226
LAKE CHARLES, LA 70602
MARK BILLODEAUX

COMMODOREE 64 USER'S GROUP OF BATON ROUGE
PO BOX 1422
BATON ROUGE, LA 70821

COMMODORE USER'S GROUP OF OACHITA
PO BOX 175
SWARIC, LA 71281
318-343-8044

ARK-LA-TEX COMMODORE 64 CLUB
198 INDIA DRIVE
SHREVEPORT, LA 71115
318-797-9702

VIC USER'S GROUP
5064 BODOWN ST.
MARRERO, LA 70072
504-341-5305

FRANKLIN PARISH COMPUTER CLUB
#3 FAIR AVE.
WINNISBORO, LA 71295

64 CLUB
PO BOX 1422
BATON ROUGE, LA 70821
504-925-5870

SOUTHWEST LOUISIANA USER'S GROUP
RT. 1, BOX 155JA
DEQUINCY, LA 70633
STEVE BEESON

COMMODORE PET USER GROUP
616 NIAGARA CIRCLE
GRETNA, LA 70053
504-394-4928
STAN PAPE

Maine

SOUTHERN MAINE COMMODORE
PO BOX 416
SCARBOUROUGH, ME 04074
207-761-1626
STEVE SHAPIRO

COMPUMANIA
81 NORTH ST.
SACO, ME 04072
207-282-7418

SO. AROOSTOOK COMMODORE USER'S GROUP
PO BOX 451
HOULTON, ME 04730
207-532-6287
ROBERT REECE

COASTAL COMMODORE CLUB
WALDOBORO VILLAGE, APT. 9
WALDOBORO, ME 04572

NORTHWOODS COMMODORE USER'S GROUP
740 MAIN ST.
VAN BUREN, ME 04785

COM-VICS
RFD #1, BOX 2086
HEBRON, ME 04238
207-966-3641

YOUR COMMODORE USER'S GROUP
BOX 611
WESTBROOK, ME 04092
207-854-4579

Maryland

CUM-BACC
PO BOX 479
REISTERSTOWN, MD 21136

ANNAPOLIS COMMODORE USER'S GROUP
PO BOX 3358
ANNAPOLIS, MD 21403
301-956-3458

COMPUCATS COMMODORE COMPUTER CLUB
680 W. BEL AIR AVE.
ABERDEEN, MD 21001
301-272-0472

COMMODORE 64 USER'S GROUP
11209 TACK HOUSE COURT
POTOMAC, MD 20854
301-983-8199

HAGERSTOWN USER'S GROUP
23 COVENTRY LANE
HAGERSTOWN, MD 21740
301-979-9728

HOUSE OF COMMODORE
8835 SATYR ROAD
BALTIMORE, MD 21234

BLUE TUSK
700 EAST JOPPA ROAD
BALTIMORE, MD 21204

LONG LINES COMPUTER CLUB
323 N. CHARLES ST.
ROOM 201
BALTIMORE, MD 21201

FREDERICK FUNCTIONEERS
8512 YELLOW SPRINGS ROAD
FREDERICK, MD 21701
301-695-6561
SCOT GARDNER

ASSN. OF PERSONAL COMPUTER USERS
5014 RODMAN ROAD
BETHESDA, MD 20016

VICLIQUE
105A CONDUIT ST.
ANNAPOLIS, MD 21401
301-263-8568

MONTGOMERY COUNTY COMMODORE COMPUTER SOCIETY
PO BOX 2689
SILVER SPRING, MD 20902
301-770-6778
DAVE MENAKER

GAITHERSBURGH C-64 USER'S GROUP
12937 PICKERING DRIVE
GERMANTOWN, MD 20874
301-428-3328

ROCKVILLE VIC/64 USER'S GROUP
5112 PARKLAWN TERRACE #103
ROCKVILLE, MD 20852
301-231-7823

THE BOYDS CONNECTION
21000 CLARKSBURG ROAD
BOYDS, MD 20841
301-428-3174

EDISON COMMODORE USER'S GROUP
4314 OXFORD DRIVE
SUITLAND, MD 20746
301-423-7155

HYATTSVILLE C-64 USER'S GROUP
7209 DARTMOUTH AVE.
COLLEGE PARK, MD 20740
301-779-8369

SO. MARYLAND COMMODORE USER'S GROUP
6800 KILLARNEY ST.
CLINTON, MD 20735
301-868-6536

WICOMICO C-64 CLUB
1306 HAMILTON ST.
SALISBURY, MD 21801
SAM SULLIVAN

JUMPERS '64 COMMODORE USER'S GROUP
712 SNOWDON LANE
GLEN BURNIE, MD 21061
301-969-6088
ALAN KNEPPER

BAY CUG
4605 VOGT AVE.
BALTIMORE, MD 21206
301-325-2156

WESTINGHOUSE BWI COMMODORE USER GROUP
PO BOX 1693
BALTIMORE, MD 21203

Massachusetts

MIT LINCOLN LABORATORY COMPUTER CLUB
244 WOOD ST.
LEXINGTON, MA 02173

BOSTON COMPUTER SOCIETY
THREE CENTER PLAZA
BOSTON, MA 02108

THE COMMODORE CONNECTION
132 NORTH RIDGE ROAD
WESTFIELD, MA 01085
413-568-2228
PAUL JENNEY

FOXBORO AREA COMMODORE USER'S GROUP
PO BOX 494
MANSFIELD, MA 02048

CAPE COD 64 USER'S GROUP
358 FORREST ROAD
S. YARMOUTH, MA 02664
800-225-7136

EM 20/64 USER'S GROUP
24 COTTAGE ST.
STONEHAM, MA 02180
617-438-7133

COMMODORE USER'S GROUP
269 LINCOLN ST.
WORCESTER, MA 01605
BEST BUSINESS EQUIP.

BERKSHIRE HOME FOR LITTLE PET USERS
401 POMEROY AVE.
PITTSFIELD, MA 01201

PIONEER VALLEY COMMODORE CLUB
6 LAUREL TERRACE
WESTFIELD, MA 01085
413-562-1027

MASSPET COMMODORE USER'S GROUP
PO BOX 307
EAST TAUNTON, MA 02718

VIC USER'S GROUP
193 GARDEN ST.
NEEDHAM, MA 02192

EASTERN MASSACHUSETTS VIC USER GROUP
7 FLAGG ROAD
MARLBORO, MA 02173

RAYTHEON COMMODORE USER'S GROUP
HARTWELL ROAD
GRA-6
BEDFORD, MA 01730

COMMODORE 64 USER'S GROUP OF THE BERKSHIRES
184 HIGHLAND AVE.
PITTSFIELD, MA 01201

COMMODORE USER'S CLUB
STOUGHTON HIGH SCHOOL
STOUGHTON, MA 02072

VIC INTERFACE CLUB
48 VAN CLIFF AVE.
BROCKTON, MA 02401

Michigan

KALAMAZOO VALLEY HOME USER'S GROUP
PO BOX 3085
KALAMAZOO, MI 49003

COMMODORE USER'S GROUP OF DURAND
PO BOX 188
LENNON, MI 48449
MARLA ROMINE

VAN BUREN USER'S GROUP
50984 35½ ST.
MAPLE LAKE
PAW PAW, MI 49079
ROBERT TOMPSETT

DELTON AREA USER GROUP
11386 LETCHES LANE
DELTON, MI 49046
AL PILUKAS

COMMODORE COMPUTER CLUB OF MONROE
PO BOX 586
MONROE, MI 48161
313-369-2291
BOB TRIMBLE

DOWNRIVER COMMODORE GROUP
17029 KEPPEN
ALLEN PARK, MI 48101
313-274-2589
RON MARSHALL

QUORUM OF 64
214 W. STATE ST.
CLARE, MI 48617
517-386-2251
DAVID JENSEN

EDWARDSBURG COMMODORE USER'S GROUP
406 BRUSH ROAD
NILES, MI 49120
616-663-2792
DOUG STRINGFELLOW

W. MICHIGAN COMMODORES
1952 CLEVELAND AVE. SW
WYOMING, MI 49509
616-458-9724

DEBUG
PO BOX 196
BERRIEN SPRINGS, MI 49103
616-471-1882

DAB COMPUTER CLUB
PO BOX 542
WATERVLIET, MI 49098
616-463-5457

SEM 64
2501 FIVE MILE #3
REDFORD, MI 48239
313-537-4163

ANN ARBOR COMMODORE USER'S GROUP
ANN ARBOR, MI 48103
313-994-4751

COMP
486 MICHIGAN AVE.
MARYSVILLE, MI 48040
313-364-6804

MICHIGAN'S COMMODORE 64 USER'S GROUP
PO BOX 539
E. DETROIT, MI 48021
313-773-6302

JACKSON COMMODORE COMPUTER CLUB
201 S. GRINNELL ST.
JACKSON, MI 49203

TRI-CITIES USER'S GROUP
PO BOX 45
BAY CITY, MI 48706
517-893-6999

W. MICHIGAN VIC/64 USERS
1311 PORTLAND NE
GRAND RAPIDS, MI 49505

VIC FOR BUSINESS
6027 ORCHARD COURT
LANSING, MI 48910

COMMODORE USER'S GROUP
1010 SPICERVILLE HIGHWAY
EATON RAPIDS, MI 48827

COMMODORE COMPUTER CLUB
H. DOW HIGH SCHOOL, ROOM #226
MIDLAND, MI 48640
517-835-5130

DAVID LIEM
14361 WARWICK ST.
DETROIT, MI 48223

SOUTH COMPUTER CLUB
45201 OWEN
BELLEVILLE, MI 48111
SOUTH JR. HIGH SCHOOL

VIC USER'S CLUB
UNIV. MICHIGAN SCHOOL
OF PUBLIC HEALTH
ANN ARBOR, MI 48109

COMMODORE USER CLUB
32303 COLUMBUS DRIVE
WARREN, MI 48093

VIC/64/PET USER'S GROUP
8439 ARLIS ROAD
UNION LAKE, MI 48085

COMMODORE USER'S GROUP
3947 W. TWELVE MILE ROAD
BERKLEY, MI 48072

SOUTHEAST MICHIGAN PET USERS
BOX 214
FARMINGTON, MI 48024

TRI-COUNTY COMPUTER CLUB
501 E. LOOMIS
LUDINGTON, MI 49431

Minnesota

METRO AREA COMMODORE COMPUTER CLUB
BOX M
MENDOTA, MN 55150
612-729-0232

CENTRAL MN COMPUTER USER'S GROUP
217 RIVERSIDE AVE. SOUTH
SARTELL, MN 56377
DAVID HUNT

BRAINERD AREA COMMODORE USER'S GROUP
1219 SE 11TH ST.
BRAINERD, MN 56401

SMCUG
1002 PFAU ST.
MANKATO, MN 56001
507-625-6942

HEARTLAND AREA COMPUTER COOPERATIVE
RT. 4, BOX 204
LITTLE FALLS, MN 56345
612-632-5511

LAKE SUPERIOR COMMODORE
1936 LAWN ST.
DULUTH, MN 55812
218-728-3224

MINNESOTA COMMODORE USER'S ASSOCIATION
PO BOX 32219
FRIDLEY, MN 55432

TWIN CITIES COMMODORE CLUB
6623 IVES LANE
MAPLE GROVE, MN 55369
612-424-2425

MINNECOMM 64
PO BOX 24751
MINNEAPOLIS, MN 55424
612-423-2293
GEORGE AUGHEY

CLUB 64
256 16TH ST. NE
OWATONNA, MN 55060
507-451-0128
STEPHEN KNUDIEN

MUPET
PO BOX 179
ANNANDALE, MN 55302

Mississippi

COMMODORE BILOXI USER GROUP
3002 HIGHWAY 90 EAST
OCEAN SPRINGS, MS 39564
601-875-1173

COMMODORE COMPUTER CLUB
SO. STATION BOX 10076
HATTIESBURG, MS 38401
601-268-7585

Missouri

HEARTLAND USER'S GROUP
PO BOX 1251
CAPE GIRARDEAU, MO 63701
314-335-8134
HYMAN TANNER

CARTHAGE COMMODORE COMPUTER CLUB
PO BOX 842
CARTHAGE, MO 64836
417-358-5567
GARY BAIRD

SALEM COMMODORE USER'S CLUB
PO BOX 73
SALEM, MO 65560
KARL DITTMAN

KCPUG
5214 BLUE RIDGE BLVD.
KANSAS CITY, MO 65133

PET SET CLUB OF ST. LOUIS
633 BENT OAK DRIVE
LAKE ST. LOUIS, MO 63367

COMMODORE USER CLUB OF THE OZARKS
211 N. AURORA
ELDON, MO 65026
314-392-4248

COMMODORE USER'S GROUP OF ST. LOUIS
BOX 6653
ST. LOUIS, MO 63125

COMMODORE USER'S GROUP OF WARRENSBURG
PO BOX 893
WARRENSBURG, MO 64093
816-747-2406
BUCK SOMMERKAMP

MID MISSOURI COMMODORE CLUB
1804 VANDIVER DRIVE
COLUMBIA, MO 65201

COMPUTERS OF THE BOOTHEEL USER GROUP
1925 TREASURE DRIVE
KENNETT, MO 63857
MICHAEL JETT

Montana

POWDER RIVER COMPUTER CLUB
POWDER RIVER HIGH SCHOOL
BROADUS, MT 59317

MISSOULA COMMODORE USERS
310 8TH ST.
STEVENSVILLE, MT 59870
406-777-3879
JOHN VERBURG

CASCADE COUNTY USER'S GROUP
PO BOX 739
GREAT FALLS, MT 59403
406-459-1016
JERRY SPURBECK

COMMODORE USER CLUB
1109 WEST BROADWAY
BUTTE, MT 59701

Nebraska

LINCOLN COMMODORE USER'S GROUP
PO BOX 30655
LINCOLN, NE 68503
SECRETARY

GREATER OMAHA COMMODORE 64 USER GROUP
805 GINNY AVE., APT. 21
BELLEVUE, NE 68005
RICHARD MEYER

PATHFINDERS 64
2133 CLARMAR ST.
FREMONT, NE 68025
402-721-4346
KENT TEGELS

THE COMPUTER POWER UNLIMITED
416 N. 27TH
LINCOLN, NE 68503
402-475-8081
ROBERT HOWARD

ALLIANCE COMMODORE COMPUTER CLUB
1629 BOISE
ALLIANCE, NE 69301

Nevada

COMMODORE RENO USER'S NETWORK
PO BOX 8566
RENO, NV 89507
702-972-3801
RICK COOKE

SILVER STATE COMPUTER USER'S GROUP
PO BOX 81075
LAS VEGAS, NV 89180
KAREN DOUGLAS

SOG COMMODORE USER'S GROUP
4011 W. CHARLESTON BLVD.
LAS VEGAS, NV 89201
702-646-5656
LEE SCHRAM

CATFUN USER'S CLUB
PO BOX 2155
FALLON, NV 89406

COMPU CLUB 64
4220 S. MARYLAND PARKWAY
BLDG. B
LAS VEGAS, NV 89109
702-369-7354

LAS VEGAS PET USERS
5130 E. CHARLESTON BLVD.
SUITE 5-315
LAS VEGAS, NV 89122

New Hampshire

MONADNOCK USER GROUP FOR COMMODORE OWNERS
135 LIBERTY LANE
KEENE, NH 03431
603-352-5948
P. KIRKPATRICK

AMOSKEAG C-64 USER GROUP
61 PROSPECT ST.
MANCHESTER, NH 03104
603-669-6277
BRAD & NANCY MAYER

NORTHERN NEW ENGLAND COMPUTER SOCIETY
PO BOX 69
BERLIN, NH 03570

64 USERS
PO BOX 878
ROCHESTER, NH 03867

New Jersey

INFO-64
16 RIDGEWOOD AVE.
VIDEO DYNAMICS
RIDGEWOOD, NJ 07450
201-447-4422

PLASMA PHYSICS LAB USER GROUP
PRINCETON UNIV.
PO BOX 451
PRINCETON, NJ 08544

CUMBERLAND COUNTY COMMODORE USER GROUP
1976 NORTH EAST AVE.
VINELAND, NJ 08360
609-692-9366

JERSEY SHORE COMMODORE USER'S GROUP
89 STRATFORD ROAD
TINTON FALLS, NJ 07724
201-542-2113
BOB MCKINLEY, JR.

BORDENTOWN AREA C-64 USER'S GROUP
PO BOX 381
BORDENTOWN, NJ 08505
JOE GRINER

RANCOCAS VALLEY USER GROUP
PO BOX 234
MT. LAUREL, NJ 08054
609-267-1912

PARSIPPANY COMPUTER GROUP
51 FERNCLIFF ROAD
MORRIS PLAINS, NJ 07950
201-267-5231

SO. JERSEY COMMODORE USER'S CLUB
46-B MONROE PATH
MAPLE SHADE, NJ 08052
609-667-9758

COMMODORE FRIENDLY USER GROUP
49 HERSHEY ROAD
WAYNE, NJ 07470
201-696-8043

SOMERSET USER'S CLUB
49 MARCY ST.
SOMERSET, NJ 08873

VIC-TIMES
46 WAYNE ST.
EDISON, NJ 08817

ACGNJ PET/VIC/CBM
30 RIVERVIEW TERRACE
BELLE MEAD, NJ 08502
201-359-3862

VIC SOFTWARE DEVELOPMENT CLUB
7 FOMALHAUT AVE.
SEWELL, NJ 08080

EDUCATOR'S ADVISORY
PO BOX 186
MEDFORD, NJ 08055
609-935-1200

VIC USER GROUP
67 DISTLER AVE.
W. CALDWELL, NJ 07006
201-284-2281

TBH VIC-NICS
PO BOX 981
SALEM, NJ 08079

AMATEUR COMPUTER GROUP
18 ALPINE DRIVE
WAYNE, NJ 07470

MORRIS AREA COMMODORE USER'S GROUP
61 EARLY ST.
MORRISTOWN, NJ 07960
201-267-5088

HUDSON COUNTY COMMODORE USER'S GROUP
308 PALISADE AVE.
UNION CITY, NJ 07083
201-330-8317

New Mexico

ALAMOGORDO COMMODORE USER'S GROUP
PO BOX 231
ALAMOGORDO, NM 88310

TAOS AREA COMMODORE USER'S GROUP
PO BOX 5089
TAOS, NM 87571
505-758-4458
DAVID HULL

NEW MEXICO COMMODORE USER'S GROUP
PO BOX 37127
ALBUQUERQUE, NM 87176
505-884-3778
SUSAN PALMER

COMMODORE USER'S GROUP OF ROSWELL
304 E. COUNTRY CLUB ROAD
ROSWELL, NM 88201
505-623-4376
GEORGE BARRY

SO. NEW MEXICO COMMODORE USER GROUP
PO BOX 4437, UNIV. PARK BRANCH
LAS CRUCES, NM 88001
505-522-7622
DAVID SELWYN

New York

SCUG
CANAL SQUARE
SCHENECTADY, NY 12305

COMMODORE USER'S GROUP OF MASSENA
MASSENA COMPUTER CENTER
HARTE HAVEN PLAZA
MASSENA, NY 13662

MICRO-HUT USER'S GROUP
62 EAST MAIN ST.
BAY SHORE, NY 11706
516-666-7805
JOSEPH MOON III

CAVE
PO BOX 10
HOLCOMB, NY 14469
716-657-6575

RAINBOW INTERNATIONAL C-64 USER GROUP
947 HARRISON AVE.
NIAGARA FALLS, NY 14305
ROBERT HEMMINGS

BRONX-64 USER'S GROUP
PO BOX 47, CORNELL STATION
BRONX, NY 10473
DAVE RIVERA

FOLKLIFE TERMINAL CLUB
BOX 555/JW CO-OP CITY STATION
BRONX, NY 10475

BROOKLYN COMMODORE USER'S GROUP
1735 EAST 13TH ST., APT. 7N
BROOKLYN, NY 11229
718-375-5278
MALCOM GOTTESMAN

SIMONS' BASIC USER GROUP
6 BETHLEHEM PLACE
POUGHKEEPSIE, NY 12603
ROBERT WEGLINSKI

CLUB-64
1579 COATES AVE.
HOLBROOK, NY 11741
516-289-9271
CHRIS THEODORE

CENTRAL NEW YORK COMMODORE USER GROUP
8037 MORGAN ROAD
LIVERPOOL, NY 13088
315-622-2913
CARL BITTEL

PLATTSBURGH COMMODORE USER'S GROUP
61 EAST MAIN ST.
MORRISONVILLE, NY 12962
518-563-5764
STEVE NOLAN

COMMODORE USER'S GROUP OF ROCHESTER
PO BOX 26514
ROCHESTER, NY 14626
716-544-5251

CHAUTAUQUA COUNTY COMMODORE USER GROUP
19-21 EAST MAIN ST.
WESTFIELD, NY 14787
716-326-2222
MARK DUNLAP

ELITE GROUP
3207 TENBROECK AVE.
BRONX, NY 10469
RICHARD BAILEY

VIC USER GROUP
KODAK PARK, PAPER DIVISION
ROCHESTER, NY 14617

OSWEGO 64 USERS
208 PARK HALL, DEPT. INDUSTRIAL ARTS
OSWEGO, NY 13126
315-341-3010

POUGHKEEPSIE VIC USER GROUP
2 BROOKLANDS FARM ROAD
POUGHKEEPSIE, NY 12601
914-462-4518

COMMODORE COMPUTER CLUB
1111 STEWART AVE.
BETHPAGE, NY 11714
516-575-9558

HELLO CENTRAL
76-12 35TH AVE.
JACKSON HEIGHTS, NY 11372

MANHATTAN 64
1440 FREEPORT LOOP
BROOKLYN, NY 11239
212-647-4266

ROCKLAND COUNTY COMMODORE USER GROUP
PO BOX 573
NANUET, NY 10965

NEW YORK 64 USER'S GROUP
222 THOMPSON ST.
NEW YORK, NY 10012
212-673-7241

VIC/64 USER'S GROUP
WAVERLY PLACE
NEW YORK, NY 10003
212-358-5155

ADIRONDACK C-64 USER'S GROUP
205 WOODLAWN AVE.
SARATOGA SPRINGS, NY 12866
518-584-8960

L&M COMPUTER CLUB
4 CLINTON ST.
TULLY, NY 13159
315-696-8904

CAPITAL DISTRICT 64/VIC USER'S GROUP
363 HAMILTON ST.
ALBANY, NY 12210
518-436-1190

VIC USER'S CLUB
339 PARK AVE.
BABYLON, NY 11702
516-669-9126

CHENANGO COUNTY COMMODORE HELPERS AND USERS GROUP
PO BOX 487
NORWICH, NY 13815
607-336-3903

VIC USER GROUP
1250 OCEAN AVE.
BROOKLYN, NY 11239
212-859-3030

LIVE
17 PICADELLY ROAD
GREAT NECK, NY 11023

ROCKLAND COUNTY COMMODORE
14 HILLSIDE COURT
SUFFERN, NY 10901

SPUG
4782 BOSTON POST ROAD
PELHAM, NY 10803

PET USER CLUB
PO BOX 1280
WHITE PLAINS, NY 10602

WESTCHESTER COUNTY VIC USER'S GROUP
PO BOX 146
PELHAM, NY 10552

VIC USER'S CLUB
76 RADFORD ST.
STATEN ISLAND, NY 10314

COMMODORE MASTERS
25 CROTON AVE.
STATEN ISLAND, NY 10301

SECTOR ONE COMPUTER
19-21 EAST MAIN ST.
WESTFIELD, NY 14787
716-326-4479

COMMODORE BUFFALO USER'S GROUP
199 DALE DRIVE
TONAWANDA, NY 14150
716-631-3932

MOHAWK VALLEY COMMODORE USER GROUP
PO BOX 343
TRIBES HILL, NY 12177
518-829-7576

COMMODORE 64 USER'S GROUP
67-42 HARROW ST.
FOREST HILLS, NY 11375

STATEN ISLAND COMMODORE USER GROUP
3770 RICHMOND AVE.
STATEN ISLAND, NY 10312
212-984-4256

NEW YORK CITY VIC/C64 USER GROUP
436 EAST 69TH ST.
NEW YORK, NY 10021

North Carolina

UNIFOUR COMMODORE USER'S GROUP
PO BOX 9324
HICKORY, NC 28603
JANET MORRIS

COMMODORE USER'S GROUP
RT. 1, BOX 349-B
SALISBURY, NC 28144
CHARLES HUFFMAN

TRYON COMMODORE 64 CLUB
PO BOX 1016
TRYON, NC 28782
704-859-6340

DOWN EAST COMMODORES
302 BELLTOWN ROAD
HAVELOCK, NC 28532
919-447-4536

RALEIGH VIC/64 USER'S GROUP
410-D DELTA COURT
CARY, NC 27511
919-469-3862

WILMINGTON COMMODORE USER'S GROUP
409 RL HONEYCUTT DRIVE
WILMINGTON, NC 28403
919-799-5041

Ohio

HAROLD WINKLE
3337 GLENWAY AVE.
CINCINNATI, OH 45205

CAM AREA USER'S GROUP
334 FAIRVIEW SE
NORTH CANTON, OH 44720
216-499-7990
LOREN HINES

SOUTHWESTERN OHIO COMMODORE USER GROUP
PO BOX 46644
CINCINNATI, OH 45246

YOUNGSTOWN C-64 USER'S GROUP
209 NORTH PEARL
COLUMBIANA, OH 44408
216-482-4758
CHARLES LONGBOTTOM

UCOM-64
340 TANGEMAN U CENTER
MAIL LOC 136
CINCINNATI, OH 45221

NORTHEAST OHIO COMMODORE USER GROUP
PO BOX 718
MENTOR, OH 44061

COMMODORE COMPUTER CLUB OF TOLEDO
PO BOX 8909
TOLEDO, OH 43623
419-475-9160
JIM CYCHLER

COMMODORE USERS IN AKRON
PO BOX 9243
AKRON, OH 44305

COMMODORE CLUB OF CENTRAL OHIO
PO BOX 292392
COLUMBUS, OH 43229

AKRON AREA C-64 USER'S GROUP
2453 SECOND ST.
CUYAHOGA FALLS, OH 44221
216-923-4396
PAUL HARDY

COMMODORE 64 USER'S GROUP
702 PARK AVE. NW
NEW PHILADELPHIA, OH 44663

COMMODORE USERS OF BLUE CHIP
816 BEECHER ST.
CINCINNATI, OH 45206
513-961-6582

CPU CONNECTION
PO BOX 42032
BROOK PARK, OH 44124

CINCINNATI COMMODORE COMPUTER CLUB
PO BOX 450
OWENSVILLE, OH 45160
513-732-6572
WALLY JONES

SE CLEVELAND COMMODORE CRAZIES
18813 HARLAN DRIVE
MAPLE HEIGHTS, OH 44137
216-581-3099

Oklahoma

GREATER OKLAHOMA COMMODORE CLUB
PO BOX 96751
OKLAHOMA CITY, OK 73143

STILLWATER C-64 USER'S GROUP
3124 N. LINCOLN
STILLWATER, OK 74075
405-372-1308

TULSA AREA COMMODORE USER'S GROUP
7804 N. 117TH AVE.
OWASSO, OK 74055
918-272-9755

COMMODORE USER'S GROUP
202 S. 12TH ST.
MUSKOGEE, OK 74401
MUSKOGEE COMPUTER SOCIETY

COMMODORE OKLAHOMA USER'S CLUB
4000 NW 14TH ST.
OKLAHOMA CITY, OK 73107
405-943-1370

COMMODORE USERS
BOX 268
OKLAHOMA CITY, OK 73101

COMMODORE USERS OF NORMAN
209 BROOKWOOD
NOBLE, OK 73068

COMMODORE USERS OF BARTLESVILLE
1704 S. OSAAGE
BARTLESVILLE, OK 74003
918-336-0233
FRED MAYES

Oregon

SOUTHERN OREGON VIC/64 USER'S GROUP
3600 MADRONA LANE
MEDFORD, OR 97501
503-779-7631

SPRINGFIELD COMMODORE USER'S GROUP
4400 FRANKLIN AVE., STE. #1443
EUGENE, OR 97403
503-741-2522

LANE COUNTY C-64 USER'S GROUP
PO BOX 11316
EUGENE, OR 97440
503-726-2131

JEFFERSON STATE COMPUTER USER'S GROUP
PO BOX 4335
MEDFORD, OR 97501

SPRINGFIELD COMMODORE USER'S GROUP
5324 B ST.
SPRINGFIELD, OR 97478
503-741-2522
MARK JOERGER

COMPUTER USERS
86313 FRANKLIN BLVD.
EUGENE, OR 97405
503-726-8500

US COMMODORE USER'S GROUP
PO BOX 2310
ROSEBURG, OR 97470
503-672-7591

CAVEMAN COMMODORE COMPUTER CLUB
5836 LOWER RIVER ROAD
GRANTS PASS, OR 97526
503-479-7409
KEN CROUSE

Pennsylvania

NORTH COAST COMMODORE USER'S GROUP
PO BOX 6117
ERIE, PA 16512

BEAVER COUNTY AREA COMMODORE USER'S GROUP
112 SPRUCE DRIVE
MONACA, PA 15061
412-774-9080
H.J. HEMER

BLUE JUNIATA COMMODORE USER'S GROUP
107 WASHINGTON AVE.
LEWISTOWN, PA 17044
CLIFTON BELL, JR.

ABC C-64 CHIPS COMMODORE USER GROUP
3159 MIDDLETOWN ROAD
BETHLEHEM, PA 18017
THOMAS DIFF

LOWERBUCKS USER'S GROUP
252 MAKEFIELD ROAD
MORRISVILLE, PA 19067
DON MOYER

MAIN LINE COMMODORE USER'S GROUP
1046 GENERAL ALLEN LANE
WEST CHESTER, PA 19382
215-388-1581
EMIL VOLCHECK

CENTRAL PA USER GROUP FOR COMMODORE
BOX 102
SALONA, PA 17767
717-726-4564
JOSEPH COFFMAN

WEST BRANCH COMMODORE USER'S GROUP
PO BOX 995
WILLIAMSPORT, PA 17703
717-323-7901
GENE LOVELAND

COMPUSTARS
440 MANTAWNY ST.
POTTSDOWN, PA 19464

VIC PROGRAMMERS, INC.
115 OLD SPRING ROAD
COATESVILLE, PA 19320

PACS COMMODORE USER'S CLUB
20TH AND OLNEY STS.
PHILADELPHIA, PA 19141
215-951-1258

NADC COMMODORE USER'S CLUB
248 OAKDALE AVE.
HORSHAM, PA 19044

PET USER GROUP
PO BOX 371
MONTGOMERYVILLE, PA 18936

WESTMORELAND COMMODORE USER'S CLUB
PO BOX 3051
GREENSBURG, PA 15601

PPG
2015 GARRICK DRIVE
PITTSBURGH, PA 15235
412-371-2882

GRC USER CLUB
300 WHITTEN HOLLOW ROAD
NEW KENSINGTON, PA 15068

G/C COMPUTER OWNER'S GROUP
PO BOX 1498
READING, PA 19607
215-775-2600

COMPSTARS
130 BLUE TEAL CIRCLE
AUDUBON, PA 19403

BOEING EMPLOYEES PERSONAL COMPUTER CLUB
PO BOX 16858
PHILADELPHIA, PA 19142
215-522-2257

VIC SOFTWARE DEVELOPMENT CLUB
440 W. SEDGWICK, APT. A-1
PHILADELPHIA, PA 19119
215-844-4328

BITS & BYTES
1015 DALE ROAD
SECANE, PA 19018
215-544-5875

CLIFTON HEIGHTS USER'S GROUP
PO BOX 235
CLIFTON HEIGHTS, PA 19018

COMMODORE USER'S GROUP
781 DICK AVE.
WARMINSTER, PA 18974

SOUTH CENTRAL PENN COMMODORE CLUB
21009 CEDAR RUN DRIVE
CAMP HILL, PA 17011
717-763-4219

CACC CENTER AREA COMMODORE COMPUTER CLUB
214 COMPUTER BUILDING
UNIVERSITY PARK, PA 16802
814-237-5912

COMMODORE USER'S CLUB OF SE PENN
2407 PENNSYLVANIA AVE.
WEST MIFFLIN, PA 15122

WORLDWIDE COMMODORE USER'S GROUP
PO BOX 337
BLUE BELL, PA 19422

WYOMING VALLEY COMMODORE USER GROUP
304 EAST ORIOLE DRIVE
LARKSVILLE, PA 18704
717-288-7949

SCRANTON COMMODORE USER'S GROUP
PO BOX 211
CLARK'S SUMMIT, PA 18411

MID-ATLANTIC REGIONAL COMMODORE ASSOCIATION
PO BOX 76
MT. HOLLY SPRINGS, PA 17065
717-486-3274

BELLWOOD-ALTOONA SWAPPERS IN COMMODORE
515 E. 26TH AVE.
ALTOONA, PA 16601
814-942-9565

CASTLE COMMODORE COMPUTER CLUB
RD #1, BOX 210A
EDINBURG, PA 16116
412-652-3352

EPA COMMODORE USER'S GROUP
1712 AIDEN LAIR ROAD
DRESLER, PA 19025
EDWARD COHEN

Rhode Island

NEWPORT COMPUTER CLUB
PO BOX 1439
NEWPORT, RI 02840
DENNIS RITTER

NARRAGANSETT COMMODORE USER'S GROUP
PO BOX 8707
CRANSTON, RI 02920
401-942-5509
KENNETH GASPAR

NEWPORT VIC/64 USERS
10 MAITLAND COURT
NEWPORT, RI 02840
401-849-2684

IRVING SILVERMAN, CPA
160 TAUNTON AVE.
E. PROVIDENCE, RI 02914

COMMODORE USER'S GROUP
978 TIOGUE AVE.
COVENTRY, RI 02816
401-828-7385

RHODE ISLAND COMMODORE USER'S GROUP
4 MOWRY AVE.
JOHNSTON, RI 02919
401-231-3537
JOE OSBORNE

COMMODORE CONNECTION USER'S GROUP
PO BOX 929
WOONSOCKET, RI 02895

South Carolina

COMPUTER USER SOCIETY OF GREENVILLE
347 S. PLEASANTBURG DRIVE
GREENVILLE, SC 29607
803-235-7922

SPARTANBURG COMMODORE USER'S GROUP
PO BOX 319
SPARTANBURG, SC 29304

COMMODORE COMPUTER CLUB OF COLUMBIA
PO BOX 2775
CAYCE-WEST COLUMBIA, SC 29171

BEAUFORD TECHNICAL COLLEGE
100 S. RIBAUT ROAD
BEAUFORD, SC 29902

CHARLESTON COMPUTER SOCIETY
PO BOX 5264
N. CHARLESTON, SC 29406
803-747-0310

COMMODORE KIDS OF AMERICA USER GROUP
RT. 8, BOX 280
SUMTER, SC 29150
803-469-8861

South Dakota

VIC/64 USER'S CLUB
203 E. SIOUX AVE.
PIERRE, SD 57501
605-224-4863

PORT 64 USER GROUP
929 LEMMON ST.
RAPID CITY, SD 57701
605-342-4905
ROXANN PAPPAS

PET USER'S GROUP
515 SOUTH DUFF
MITCHELL, SD 57301
605-966-8277

Tennessee

CLARKSVILLE COMMODORE USER'S GROUP
PO BOX 67
CLARKSVILLE, TN 37040

GREENEVILLE COMPUTER HOME USER GROUP
RT. 8, BOX 138-T
GREENEVILLE, TN 37743
615-639-4919
HARRY PORTER

COMMODORE ASSN. SOUTH EAST
PO BOX 110386
NASHVILLE, TN 37211
615-834-5679
ROBERT SMITH

TRI-CITIES COMMODORE CLUB
114 SPRINGBROOK DRIVE
PEERLESS CENTER
JOHNSON CITY, TN 37601
VICKIE DAVIS

OLD HICKORY COMMODORE USER'S GROUP
25 COATES COVE
JACKSON, TN 38305
901-424-4686
CHARLES MERCER

SPRINGFIELD COMMODORE COMPUTER CLUB
RT. #1, BOX 166
SPRINGFIELD, TN 37172
615-384-4050
PAUL BELL

COMMODORE COMPUTER CLUB
PO BOX 96
ESTILL SPRINGS, TN 37330
615-649-5962
MARTY GARNER

METRO-KNOXVILLE COMMODORE USER CLUB
7450 OXMOOR ROAD
KNOXVILLE, TN 37931
615-938-3773

MEMPHIS COMMODORE USER'S GROUP
2476 REDEVRS AVE.
MEMPHIS, TN 38127
901-358-5823

ET 64 USER'S GROUP
PO BOX 495
KNOXVILLE, TN 37901

COMMODORE USER CLUB
1800 DAYTON BLVD.
METRO COMPUTER CENTER
CHATTANOOGA, TN 37405

NASHVILLE COMMODORE USER'S GROUP
PO BOX 121282
NASHVILLE, TN 37212
615-834-2073
JOE FETHERLING

Texas

MIDLAND COMMODORE USER'S GROUP
PO BOX 7355
MIDLAND, TX 79708
915-683-8398
DAVE TAYLOR

EL PASO COMMODORE USER GROUP
1736 DEAN MARTIN DRIVE
EL PASO, TX 79936
915-855-0330
JESSE MOORE

COMMODORE BRAZOS USER'S GROUP
PO BOX 9622
COLLEGE STATION, TX 77850

BILL COMPUTER CLUB
PO BOX 592
ADKINS, TX 78101

SATURDAY MORNING USER'S GROUP
PO BOX 721357
CORPUS CHRISTI, TX 78472
512-854-4156
JIM O'REAR

TRI STATE COMMODORE USER GROUP
PO BOX 8971
AMARILLO, TX 79114
806-373-4536
EARL BURLINGAME

HOT CHUG
PO BOX 21711
WACO, TX 76702
817-776-0081
JAMES DOMENGEUX

ABILINE CURSOR CONTROL
PO BOX 6261
ABILENE, TX 79608
ROMAN REYNOLDS

CORPUS CHRISTI COMMODORE USERS
3650 TOPEKA ST.
CORPUS CHRISTI, TX 78411

COMMODORE COMPUTER USERS OF TEXAS
4001 N. IH-35, SUITE 216
AUSTIN, TX 78722
512-454-2824

LARRY WILLIAMS
PO BOX 652
SAN ANTONIO, TX 78293

SOUTHEAST HOUSTON VIC
11423 KIRK VALLEY DRIVE
HOUSTON, TX 77089

CHUG
8738 WILDFOREST
HOUSTON, TX 77088
713-999-3650

PET USERS
2001 BRYAN TOWER
SUITE 3800
DALLAS, TX 75201

64 USERS
2421 MIDNIGHT CIRCLE
PLANO, TX 75075

SCOPE
PO BOX 3095
RICHARDSON, TX 75083

LONGVIEW USER'S GROUP
PO BOX 9284
LONGVIEW, TX 75608
214-759-3459
MARTHA BAGWELL

CROSSROADS COMMODORE USER'S GROUP
417 IRMA DRIVE
VICTORIA, TX 77901
512-575-0342
JERRY GUY

COMMODORE USER'S GROUP OF ODESSA
PO BOX 12491
ODESSA, TX 79768
915-332-8492

IRVING COMMODORE USER'S GROUP
PO BOX 165034
IRVING, TX 75016
LOUIS CANTU

NASACOM 64 COMMODORE CLUB
610 BAYRIDGE ROAD
LA PORTE, TX 77571
713-471-9622
ROBERT GUINN

COMMODORE ADVENTURERS
14007 DEER RUN
MAGNOLIA, TX 77355
SCOTT KING

Utah

MOUNTAIN COMPUTER SOCIETY
PO BOX 1154
SANDY, UT 84071
801-571-6813

PAYSON AREA COMMODORE USER'S GROUP
PO BOX 525
SALEM, UT 84653
801-465-4321
LARRY MUHLSTEIN

UINTAH BASIN COMMODORE USER'S GROUP
PO BOX 1102
ROOSEVELT, UT 84066

THE COMMODORE USER'S CLUB
742 TAYLOR AVE.
OGDEN, UT 84404

UTAH PUG
2236 WASHINGTON BLVD.
OGDEN, UT 84401

VIC USERS
324 NORTH 300 WEST
SMITHFIELD, UT 84335

NORTHERN UTAH VIC & C-64
PO BOX 533
GARLAND, UT 84312

THE COMMODORE USER'S GROUP
652 WEST 700 NORTH
CLEARFIELD, UT 84015
801-776-3950

UTAH VALLEY COMPUTER SOCIETY
330 N. CANAL DRIVE
LINDON, UT 84062
801-785-5467
TERRY POWERS

WASATCH COMMODORE 64 USER'S GROUP
PO BOX 4028
OGDEN, UT 84402
MIKE MURPHY

Vermont

DARLENE COLBURN
RR #1, BOX 3242
RUTLAND, VT 05701
802-775-5321

GREEN MOUNTAIN COMMODORE USER'S GROUP
PO BOX 6087
RUTLAND, VT 05701

BURLINGTON AREA COMMODORE USER GROUP
6 MAYFAIR
SOUTH BURLINGTON, VT 05041
802-658-4160

Virginia

NORTHERN VA PET USERS
2045 EAKINS COURT
RESTON, VA 22091
803-860-9116

TRACE
2920 PINEHURST ROAD
RICHMOND, VA 23228
804-266-4339
E.M. REXRODE, JR.

DALE CITY COMMODORE USER'S GROUP
PO BOX 2265
DALE CITY, VA 22193

SHENANDOAH VALLEY COMMODORE USER'S GROUP
701 BUTLER AVE.
WINCHESTER, VA 22601
703-667-3954
MARY HABECKER

COMMONWEALTH 20/64
1773 WAINWRIGHT DRIVE
RESTON, VA 22090

FREDERICKSBURG COMPUTER CLUB
313 WILLIAM ST.
FREDERICKSBURG, VA 22401
703-898-6342
GEORGE WALKER

FRANCONIA COMMODORE USER'S GROUP
6209 ROSE HILL DRIVE
ALEXANDRIA, VA 22310
703-971-5021

ULTIMATE 64 EXPERIENCE
7601 SALEM ROAD
FALLS CHURCH, VA 22043
SANDY CUETO

HENRY COUNTY COMMODORE COMPUTER CLUB
RT. 8, BOX 67
MARTINSVILLE, VA 24112
KEN COFFELT

C-64 USER'S GROUP OF RICHMOND
PO BOX 9078
RICHMOND, VA 23225
ROBERT ARMSTRONG

COMMODORE HILLTOP USER GROUP
RT. 3, BOX 301-B
CEDAR BLUFF, VA 24609
703-964-9304
DOUG STILTNER

RACE COMPUTER USER'S GROUP
4726 HORSEMAN DRIVE
ROANOKE, VA 24019
703-362-3960

COMMODORE USERS OF FRANKLIN
1201 N. HIGH ST.
FRANKLIN, VA 23851
804-562-6823

NASA VIC USER GROUP
713 YORK WARWICK DRIVE
YORKTOWN, VA 23692

NORFOLK USER'S GROUP
1030 W. 43RD ST. B-4
NORFOLK, VA 23508

VIC USER'S GROUP
RT. 2, BOX 180
NORFOLK, VA 23508

TIDEWATER COMMODORE USERS
4917 WESTGROVE ROAD
VIRGINIA BEACH, VA 23455

VIC USER'S GROUP
1502 HARVARD ROAD
RICHMOND, VA 23226

FEDERATION OF COMMODORE USER SOCIETY
4301 COLUMBIA PIKE #410
ARLINGTON, VA 22204

ARLINGTON VICTIMS (20/64)
4501 ARLINGTON BLVD.
ARLINGTON, VA 22204
703-524-0236

COMMODORE USERS OF RICHMOND
205-B FORESTER COURT
RICHMOND, VA 23227

DALE CITY COMMODORE USER'S GROUP
PO BOX 2004
DALE CITY, VA 22193
703-680-2270

PENINSULA COMMODORE USER'S GROUP
PO BOX L
HAMPTON, VA 23666

CAPITAL AREA COMMODORE ENTHUSIASTS
2312 TANGLE VALE
VIENNA, VA 22180
703-938-6313

WASHINGTON AREA C-64 USER GROUP (BURKE)
PO BOX 93
MT. VERNON, VA 22121
703-360-6749

PENTAF
9912 COLONY ROAD
FAIRFAX, VA 22030
703-273-1337

WASHINGTON AREA C-64 USER'S GROUP
7426 ELDORADO ST.
MCLEAN, VA 22012
703-523-1995

Washington

TACOMA AREA COMMODORE USER'S GROUP
3015 N. PEARL D-51
TACOMA, WA 98407

UNIVERSITY 64 USER GROUP
UNIVERSITY OF WASHINGTON
PATHOLOGY DEPT.
SEATTLE, WA 98195
ALLEN GOWN, M.D.

WORLD WIDE COMMODORE USER'S GROUP
1316 HUNT AVE.
RICHLAND, WA 99352

PACIFIC NORTHWEST COMMODORE CLUB
17214 3RD AVE. SE
BOTHELL, WA 98012

COMMODORE LOVER'S CLUB
S. 1165 GRAND AVE. #20
PULLMAN, WA 99163
309-332-0239

OLYMPIA COMMODORE USER'S GROUP
PO BOX 1604
OLYMPIA, WA 98507
ROGER MCGUIRE

TRI-CITIES COMMODORE COMPUTER CLUB
1926 PINE ST.
RICHLAND, WA 99352
509-943-4734
JACK GARVIN

COMPUTER CLUB
5303 SHILSHOLE AVE. NW
SEATTLE, WA 98107
206-789-2000
ART WIBECK; EXT 1402

UNIVERSITY PLACE COMMODORE HOME USER GROUP
7722 30TH ST. WEST
TACOMA, WA 98467
206-564-7446

WHIDBEY ISLAND COMMODORE CLUB
PO BOX 1471
OAK HARBOR, WA 98277
206-675-9786
MICHAEL CLARK

SPOKANE COMMODORE USER'S GROUP
PO BOX 13201
SPOKANE, WA 99213
509-328-1464

CBM USER'S GROUP
803 EUCLID WAY
CENTRALIA, WA 98531
206-736-4085

BUNCH A BYTES
4916 121ST PLACE NE
MARYSVILLE, WA 98270

C-64 DIVERSITY USER'S GROUP
18204 67TH AVE.
ARLINGTON, WA 98223

BLUE MOUNTAIN COMMODORE USERS
667 CANARY DRIVE
WALLA WALLA, WA 99362
509-525-5452

CENTRAL WASHINGTON USER'S GROUP
1222 S. FIRST ST.
YAKIMA, WA 98902

VIC COMPUTER CLUB
947 N. BURROUGHS AVE.
OAK HARBOR, WA 98227

NW PET USER'S GROUP
2565 DEXTER N. 3203
SEATTLE, WA 98109

PET USER'S GROUP
1800 TAYLOR AVE. N. 102
SEATTLE, WA 98102

West Virginia

KANAWHA VALLEY COMMODORE COMPUTER CLUB
PO BOX 252
DUNBAR, WV 25064
304-343-7130
FLOYD STEELE

TRI-STATE COMMODORE USERS
73 PINE HILL ESTATES
KENOVA, WV 25530
304-453-2124

COMMODORE HOME USER'S GROUP
81 LYNWOOD AVE.
WHEELING, WV 26003
304-242-2605

PERSONAL COMPUTER CLUB
PO BOX 1301
CHARLESTON, WV 25325

Wisconsin

EAU CLAIRE CBM 64 USER'S GROUP
RT. 5, BOX 179A
EAU CLAIRE, WI 54703
715-874-5972

MENOMONIE AREA COMMODORE USER GROUP
510 12TH ST.
MENOMONIE, WI 54751
715-235-4987

MADISON AREA COMMODORE USER'S GROUP
3634 SWOBODA ROAD
VERONA, WI 53593

CUSSH
3614 SOVEREIGN DRIVE
RACINE, WI 53406
414-554-0156

VIC/C-64 USER GROUP
522 WEST BERGEN DRIVE
MILWAUKEE, WI 53217
414-476-8125

MACE
PO BOX 183
GREENDALE, WI 53129

SWITCH
W. 156 N. 8834 PILGRIM ROAD
MENOMONIE FALLS, WI 53051
414-255-7044

COMMODORE 64 SOFTWARE EXCHANGE
PO BOX 224
OREGON, WI 53575

MONROE COMPUTER USER'S GROUP
2915 11TH AVE.
MONROE, WI 53566
ANDREW ERICKSEN

SEWPUS
PO BOX 21851
MILWAUKEE, WI 53221

WAUKESHA AREA COMMODORE
256½ W. BROADWAY
WAUKESHA, WI 53186
414-547-9391

COMMODORE USER GROUP
1130 ELM GROVE ST.
ELM GROVE, WI 53122

CLUB 64
6156 DOUGLAS AVE.
CALEDONIA, WI 53108
414-835-4645

COMAL USER'S GROUP
5501 GROVELAND TERRACE
MADISON, WI 53716
608-222-4432

2001 64 & VIC USER'S GROUP
3119 N. 44TH ST.
MILWAUKEE, WI 53216
414-445-2117

WISCONSIN ASSN. VIC/64 ENTHUSIASTS
PO BOX 641
WAUKESHA, WI 53187
414-771-7016

CHIPS
PO BOX 1006
WEST BEND, WI 53095
414-626-4834
TERRY WESTERBEKE

FOND DU LAC AREA COMMODORE USER GROUP
1504 SHELLEY COURT
NORTH FOND DU LAC, WI 54935
DICK LENDL

KB TRIPLE C
RT. 1, BOX 153
DENMARK, WI 54208
CRAIG DELLEMANN

COMM-BAY 64
PO BOX 1152
GREEN BAY, WI 54305
414-336-3856
RICHARD LUXTON

COULEE COUNTRY COMMODORE CLUB
501½ ST. CLOUD ST.
LA CROSSE, WI 54603
EARL MCGRATH, JR.

Wyoming

COMMODORE USER'S GROUP
670 N. THIRD #B
LARAMIE, WY 82070
307-721-5908

Argentina

GRUPO USR [64] CORDOBA
CALLE MONTEVIDEO 281/PISO 5/ DPTO D
5000 CORDOBA
ARGENTINA

Australia

LISMORE C-64 USER'S GROUP
RICHMOND HILL ROAD
LISMORE 2480, NEW SOUTH WALES
AUSTRALIA
066-24-2320

GEELONG COMMODORE COMPUTER CLUB
C/O 15 JACARANDA PLACE,
BELMONT 3216
GEELONG
AUSTRALIA

VIC/CBM 64 USERS
11 GLENGARIFF DRIVE
FLOREAT PARK 6014
W. AUSTRALIA

GRIFFITH COMPUTER SOCIETY
PO BOX 425
GRIFFITH 2680
AUSTRALIA
069-62-5877
RON GAUCI

COMMODORE COMPUTER USER'S GROUP
1 PAXTON ST.
TOWNSVILLE 4810
AUSTRALIA
077-726454

Austria

COMMODORE USER'S CLUB
POSTFACH 5026
AUSTRIA
062-222-5391

Canada

FUNDY C-64 USER'S GROUP
136 ST. JAMES ST.
ST. JOHN, NEW BRUNSWICK
CANADA E2L 1V8
BRIAN DICKINSON

NOVA SCOTIA COMMODORE USERS
66 LANDRACE CRESCENT
DARTMOUTH, NOVA SCOTIA
CANADA B2W 2P9

NOVA SCOTIA COMMODORE USER'S ASSN.
PO BOX 3426 HALIFAX SOUTH
HALIFAX, NOVA SCOTIA
CANADA B3J 3J1

FUNDY C-64 USER'S GROUP
32A CANNON ROAD
QUISPAMSIS, NEW BRUNSWICK
CANADA E0G 2W0
ANNE MAGEE

C-64 USER'S GROUP OF CANADA
SNOWDON PO BOX 1205
MONTREAL, QUEBEC
CANADA H3X 3Y3
514-739-3046
ROBERT ADLER

COMVIC
PO BOX 1688
ST. LAURENT
MONTREAL, QUEBEC
CANADA H4L 4Z2

BADEN COMPUTER CLUB
PO BOX 1219, CFPO 5056
BELLEVILLE, ONTARIO
CANADA K0K 3R0
BASED IN GERMANY

ST. CATHARINES C-64 JUNIOR GROUP
32 KILBOURNE
ST. CATHARINES, ONTARIO
CANADA L2M 3E4
416-937-5652
ROB BURTCH

NIAGARA COMMODORE USER'S GROUP
15A NEILSON AVE.
ST. CATHARINES
ONTARIO
CANADA L2M 5V9
416-688-6464

FLEDGING BARRIE USER GROUP
58 STEEL ST.
BARRIE, ONTARIO
CANADA L4M 2E9

HAMILTON COMMODORE USER'S GROUP
40 BARNESDALE N.
HAMILTON, ONTARIO
CANADA L8L 6R8
416-545-1649
TONY VALERI

TORONTO PET USER'S GROUP
1912 A. AVENUE ROAD, STE. #1
TORONTO, ONTARIO
CANADA M5M 4A1
416-782-8900

ST. THOMAS USER'S COMPUTER CLUB
39 OWAISSA ST.
ST. THOMAS, ONTARIO
CANADA N5P 1T1
519-631-2243

PET EDUCATOR GROUP
PO BOX 454, STATION A
WINDSOR, ONTARIO
CANADA N9A 6L7

COMMODORE USER'S CLUB OF SUDBURY
938 BROOKFIELD AVE.
SUDBURY, ONTARIO
CANADA P3A 4K4

WPUG
9-300 ENNISKILLEN AVE.
WINNIPEG, MANITOBA
CANADA R2V 0H9

MANITOBA USER'S GROUP
771 INKSTER BLVD.
WINNIPEG, MANITOBA
CANADA R2W 0L4
204-589-2334
CHRIS BAXTER

PRINCE ALBERT COMMODORE USER'S GROUP
PO BOX 2464
PRINCE ALBERT, SASKATCHEWAN
CANADA S6V 7G3

SASKATOON COMMODORE USER'S GROUP
PO BOX 1944
SASKATOON, SASKATCHEWAN
CANADA S7K 3S5
VERA HEINZ

BONNYVILLE VIC CURSORS
BOX 2100
BONNYVILLE, ALBERTA
CANADA T0A 0L0
403-826-3992

HINTON COMPUTER CLUB
BOX 2431
HINTON, ALBERTA
CANADA T0E 1C0
K. BARTLETT

CALGARY COMMMODORE USER'S GROUP
810 CANFIELD WAY SW
CALGARY, ALBERTA
CANADA T2W 1K1

CANADIAN COMMODORE CLUB
47 COACHWOOD PLACE
CALGARY, ALBERTA
CANADA T3H 1E1

BEAVER VALLEY COMMODORE CLUB
BOX 495
MONTROSE, BRITISH COLUMBIA
CANADA V0G 1P0

VIC-TIMS
1-830 HELENA ST.
TRAIL, BRITISH COLUMBIA
CANADA V1R 3X2
604-368-9970

KCCUG
195 MARS ROAD
KELOWNA, BRITISH COLUMBIA
CANADA V1X 1H3

COMMODORE COMPUTER CLUB
PO BOX 91164
W. VANCOUVER
BRITISH COLUMBIA
CANADA V7V 3N6
MICHAEL QUIGLEY

C-64 USER'S GROUP
46 KLONDIKE ROAD
WHITEHORSE, YUKON
CANADA Y1A 3M1
403-668-7177
WARWICK BEADLE

England

N. LONDON HOBBY COMPUTER CLUB
HOLLOWAY ROAD
LONDON
ENGLAND

Circle 465 on Reader Service card.

IT'S TAX TIME THE PROGRAM YOU ALREADY KNOW HOW TO RUN

Just LOAD and RUN. The program will prompt you for all INPUTs, then compute your taxes or refund. It will PRINT directly on the IRS form or LIST to the screen. The program is thoroughly tested and was rated fastest and easiest to use of six most popular tax programs. For C-64 or C-128, supports 1525 emulated printers, disk or tape.

SAVE YOURSELF TIME AND MONEY, ORDER TODAY

1040 with A&B $25
1040 with A,B,C,D,E,G,SE,W,4562 ..... $45
California 540 with A&B $15
Yearly Update $10

add $4 shipping, send to:
L.J. Fischer, 2797 Medford Ave., Redwood City, CA 94061
Phone 415-368-7930

CROYDON MICROCOMPUTER CLUB
1111 SELHURST ROAD
SELHURST, LONDON
ENGLAND SE256LH
01-653-3207

Finland

VIC CLUB IN HELSINKI
LINNUSTA JANK J 2B7
SF-02940 ESPOO 94
FINLAND

Greece

OLYMPIAN COMPUTER CLUB
BOX 4277
APO NEW YORK, NY 09223
PAUL MULLENS

Iceland

SYNTAX
PO BOX 320
310 BORGARNES
ICELAND
BJORGVIN BJARNASON

Ireland

CLUB64
UPPER DRUMCONDRA ROAD
DUBLIN 9
IRELAND

Italy

COMMODORE 64 CLUB
V. AVIGLIANA 13/1
10138 TORINO
ITALY
U. DI STUDSHAN

SAN VITO COMMODORE USER'S GROUP
BOX 958
APO NEW YORK, NY 09240

IHS DIVISION USERS
VIA BORGONUOVO 19
MILANO
ITALY

Japan

COMMODORE USER'S CLUB OF YOKOSUKA
COMNAVFORJ (N-34)
BOX 12
FPO SEATTLE, WA 98762
DENNIS VICKLAND

Korea

COMMODORE USER'S CLUB
KPO BOX 1437
SEOUL
KOREA

Mexico

ASOCIACIONDE USARIOS COMMODORE
ARECHIGA HOLBEIN
174-6 PISO
MEXICO 18 D.F.
MEXICO

CLUB DE USARIOS COMMODORE
SIGMA DEL NORTE
MOL DEL VALLE
LOCAL 44
MEXICO 66220

COMMODORE 64 USER'S GROUP
APDO 85 CALLE ZARAGOZA 414
PUERTO VALLARTA JALISCO
MEXICO 48300

New Zealand

NELSON VIC USER'S GROUP
PO BOX 860
NELSON
NEW ZEALAND

Norway

VIC CLUB OF NORWAY
NEDRE BANKEGT 10
1750 HALDEN
NORWAY

Peru

LIMA COMMODORE CLUB
MONTE GRANDE 109 #508
LIMA 33
PERU

Puerto Rico

COMMODORE USER'S GROUP OF PUERTO RICO
CALLE 16 35-24 VILLA CAROLINA
CAROLINA, PUERTO RICO
PR 00630
809-762-2422

West Germany

KETTENBERG 24
D 5880 LUEDEN SCHEID
WEST GERMANY

EIFEL COMMODORE USER'S GROUP
MWR DIVISION
APO NEW YORK, NY 09132
(06561)5977
DON JOHNSON

SOFTWARE SWAPPER EXTRAORDINAIRE
HQ 7TH MEDCOM BOX 1
APO NEW YORK, NY 09102

INTERFACE COMPUTER CLUB
HINDENBURG STR. 98
D-2120 LUENEBURG
WEST GERMANY

West Indies

TRINIDAD ASSN. OF COMMODORE OWNERS
91 CHERRY CRESCENT
WESTMOORINGS
CARENAGE, TRINIDAD
WEST INDIES
809-637-8091

List of Advertisers

Reader Service		Page
444	Abby's Software	57
416	Academy Software	91
474	Acorn of Indiana	101
*	Aprotek	13, 69
420	Aquarian Communications	39
407	B.E.S.T.	25
411	Cardco, Inc.	CIII
438	Cardinal Software	101
480	C.E.D.	59
450	Central Point	59
419	CMS Software Systems, Inc.	15
443	C.S.M. Software, Inc.	27
*	C.O.M.B.	41
*	Commodore Business Machines	CIV
477	Computer Answers	101
443	Computer Friends	161
445	Computer Place	91
413	CompuServe Information Services	61
462	Data Stream	103
405	Digital Solutions	7
446	Digital Visions, Inc.	58
481	D.J. Software	59
448	Ergo Systems, Inc.	59
449	Federal Hill Software	30
484	Free Spirit Software	103
439	H.B.H. Sales Company	93
459	Hughes Associates	99
403	Info Designs	32, 33
421	Information Associates	45
479	I.H.T. Software	99
436	Integrated Software Systems	60
464	Iowa City Computer Consultants	53
452	Jameco Electronics	88
*	John Henry Software	23
431	Kingswood Software Assoc.	53
409	Knight Personal Software	55
422	Lance Haffner Games	69
465	L.J. Fischer	175
414	Load'N'GO! Software	31
447	Mark of the Falcon	43
476	Master Software	101
488	Megagem	103
425	Megasoft Ltd.	2, 3
426	Megasoft Ltd.	46, 47
461	Michael Konshak	57
485	Micro Doctor	103
441	Microlog Corporation	43
434	Micro World Computers, Inc.	57
428	Micro W.D.I.	93
401	Mimic Systems	17
402	Mindscape	1
*	Navarone Industries	88
454	Nibble Notch Comp. Products	69
463	N.P.S. Inc.	103
429	Omnitronix	101
486	On the Spot Graphics	103
410	Professional Software	CII
456	Quinsept	65
442	R.J. Softshop	99
*	RUN	
	Foreign Dealer	91, 43
	Jesse Jones Box Corp	91
	ReRUN Library	90
	ReRUN Winter Edition	96
	RUN Subscriptions	64
	Special Issue	89
	Subscription Probelms	103
	University Microfilms	103
415	Skyles Electric	37
435	Software Design	65
440	Software Dimensions	52
423	Sound Software	19
478	St. Mars Systems	99
432	Starpoint Software	45
430	Stat Soft	93
475	TCO Software	101
417	T&D Electronics	73
406	Timeworks	11
427	trans com, inc.	93
418	Tri Micro	51
*	Ultrabyte	18
483	Unikool	65
489	Valhala Software	103
424	Votrax	87
453	West Coast Commodore Assoc.	53
455	Wilanta Arts	99
400	X-10 Powerhouse	79
451	Xetec, Inc.	65

For further information from our advertisers, circle the corresponding Reader Service number on the Reader Service card.

*This advertiser prefers to be contacted directly.

Advertising Sales:
Steve Robbins; Ken Blakeman;
Nancy Potter
(603)-924-7138 or (800)-411-4403;

West Coast Sales Office:
Giorgio Saluti
(415)-328-3470 or (800)-227-8365
In Calif.: (800)-344-4636

This index is provided as an additional service. The publisher does not assume any liability for errors or omissions.

Circle 411 on Reader Service card.

S'MORE FOR YOUR 64

61,183 delicious bytes for your Commodore 64

S'MORE Memory, S'MORE Power, S'MORE Fun!

Now, 61K available memory
S'MORE frees up 61,183 bytes of C-64 RAM memory for un-restricted Basic programming (57% more than the standard C-64).

A bridge to C-128
The S'MORE command structure is similar to the C-128's new Basic 7.0, providing C-64 users advanced programming techniques.

S'MORE features for programming power

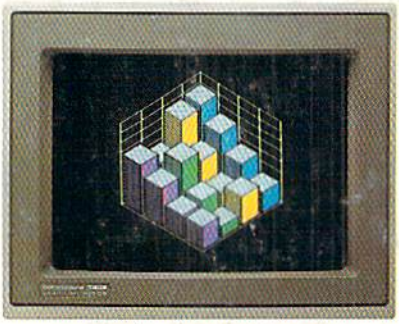
- Over 60 new and enhanced basic commands & functions
- No peeks or pokes (direct access to normally peeked/poked items)
- Full error trapping and automatic error helps
- Full up/down scrolling through program listings
- Structured programming
- Relative files
- Print using
- Formatted inputs
- Print at...and much, much more.

cardco, inc.

The Wizards from the Land of Oz Have done it Again!

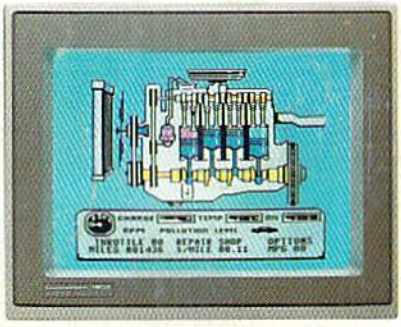
CARDCO, Inc./300 S. Topeka/Wichita, KS 67202

All you need to do this

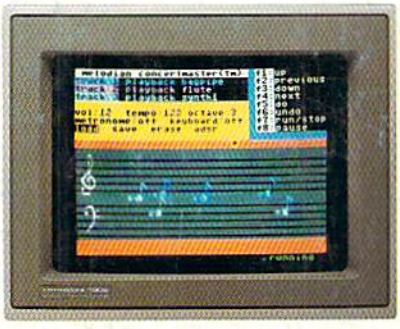


graph a spreadsheet

write a novel



fix an engine



compose a song

paint a picture

your banking

learn to fly

organize a data base

tell a story

forecast sales

When it comes to personal computers, you want the smartest you can own. At a price that makes sense.

The new Commodore 128™ system has a powerful 128K memory, expandable to 512K. An 80-column display and 64, 128 and CP/M® modes for easy access to thousands of educational, business and home programs. And a keyboard, with built-in numeric keypad, that operates with little effort.

Discover the personal computer that does more for you. At the price you've been waiting for. From the company that sells more personal computers than IBM® or Apple®.

© 1985 Commodore Electronics Limited
® CP/M is a registered trademark of Digital Research, Inc.
® Apple is a registered trademark of Apple Computer, Inc.
® IBM is a registered trademark of International Business Machines Corporation

COMMODORE 128 PERSONAL COMPUTER

A Higher Intelligence